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REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1954.

General

The past year has been one of continued progress, but the anxieties respecting accommodation became more acute. The problem of the Palm House is still under consideration and the space available in the Herbarium and Library, even to meet normal additions of specimens and books, is being rapidly taken up, so that the provision of a new Library that will also free space in the Herbarium, for which sanction has been requested, is becoming a matter of urgency.

The Director continues to serve as Vice President of the Agricultural Improvement Council and as Chairman of the Joint Committee of that body and The Agricultural Research Council. He was again appointed a Vice-President of the Royal Society.

On the occasion of the celebrations of the 250th anniversary of the inception of a Botanical Department at Glasgow University, the Director was invited to deliver an Address and the University of Glasgow conferred on him the Degree of LL.D. *honoris causa*.

On the occasion of the Annual Conference of the National Smoke Abatement Society, the Director was invited to deliver the Fifth Des Voeux Memorial Lecture on the subject of " Air Pollution and Plant Life ". He also accepted the invitation to address the Annual Weed Conference on the subject of " The Dispersal of Weed Seeds ".

It is a matter of satisfaction to record that the work of Mr. C. E. Hubbard on the *Gramineae* was recognised by the award to him of the O.B.E.

Sir Geoffrey Evans retired from the post of Economic Botanist after serving Kew in that capacity since 1938, and as Acting Director from 1941–43. The good wishes of all go with him in his retirement.

The Herbarium

Some aspects of the normal activities are indicated by the following figures :—

Specimens received for the Herbarium, excluding those prepared at Kew from living material, 55,994 ; sheets received on loan, 9,166 ; sheets sent on loan, 5,652 ; sheets distributed as duplicates, 16,424 ; sheets mounted, excluding Algae, Lichenes, Fungi, and Bryophyta, and specimens received already mounted, 47,780. The use of plastic mountant instead of paper strips is being continued.

Laying in has, in all departments, approximately kept pace with the number of sheets mounted. There is now an undue accumulation of named material requiring mounting.

Visits by botanists numbered 4,077. A large number of overseas botanists attending the Eighth International Botanical Congress at Paris, studied in the Herbarium for longer or shorter periods during the year.

A number of evening lectures, illustrated by slides or films, were given by visiting botanists or by members of the staff. They have been much appreciated and others have been arranged.

Members of the Herbarium and Library staff visited the Bedgebury Pinetum on 10 June and were shown the collections and experiments by Sir Geoffrey Evans.

During the year a total of 2,635 enquiries and plant consignments has been dealt with. Many of the enquiries involved considerable research into botanical problems, nomenclature, or literature.

Members of the scientific staff continue to be indebted to Mr. W. C. Worsdell for assistance in translating from various foreign languages and to Miss M. M. Whiting who continues to give invaluable help in a voluntary capacity in re-arranging specimens and drawings of plants from Tropical Asia.

The Keeper, Dr. W. B. Turrill, served on various scientific committees.

The following members of the staff officially attended the Eighth International Botanical Congress at Paris in July : Dr. W. B. Turrill, Dr. C. R. Metcalfe, Mr. V. S. Summerhayes, and Mr. A. A. Bullock. Dr. Turrill acted as chairman at three of the meetings and read a paper in the Genetics and Experimental Taxonomy Section. Dr. Metcalfe read a paper in the Descriptive and Dynamic Morphology and Anatomy Section. Mr. Bullock attended, as the Kew representative, the sessions on nomenclature, held before the Congress proper.

Europe, Orient and N. Africa. The department continues to receive a large proportion of the total enquiries forwarded annually to the Herbarium, and requests for information concerning British, European and cultivated plants claim many hours of work, especially during the growing season, from April to the end of October. In addition to these routine tasks, the recent arrival of several large miscellaneous collections from Birmingham University, Shrewsbury Public Library, Ludlow Museum and from Worthing (herbarium of the late Rev. A. G. Gregor) is likely to make demands upon the time of the scientific staff and the assistants for many months to come. The amount of curatorial work in

the department may be judged from the fact that one collection alone involved the preparing, mounting and putting into the Herbarium of more than 10,000 sheets. The department's assistants Miss I. Blewett and Miss P. Halliday (part-time) have shown admirable energy in dealing with this ever-increasing volume of work.

Mr. R. D. Meikle has published his survey of the Chios flora, and is now engaged on the preparation of a detailed Flora of Cyprus, to be compiled at Kew in collaboration with Mr. F. Merton. Mr. Meikle is also completing the identification of a valuable collection of Baluchistan plants mentioned in the report for 1953.

Mr. R. A. Blakelock has completed (except for *Gramineae*) the series of papers entitled " The Rustam Herbarium, 'Iraq " of which part VIII (bibliography) has been published during the past year. A provisional flora of 'Iraq, with keys to all species, has been started and Part I has already appeared in the " Kew Bulletin ". (No. 3, 1954). Assistance has been given to Dr. R. M. Gorrie in connection with an aero-survey of the vegetation of 'Iraq. Mr. Blakelock also continues his work on the family *Celastraceae*.

Part III of the Flora of Kuweit, prepared by Miss P. Lewis, and Mr. B. L. Burtt (Edinburgh) has now been completed and published. Miss Lewis is at present working on Part IV.

The National Dianthus Collection has been further augmented during the year by gifts of plants and seeds collected on the Continent. About 200 packets of seeds, chiefly from botanical gardens, have been grown by Mr. Mullins, but much of this has yielded hybrid plants related to *D. plumosus* L., and it seems that seeds from such sources are not likely to add many more species to the Collection. Seed is still urgently required from " wild " localities, particularly from S.E. Europe and Asia, whence many species, not represented at Kew, have been recorded.

Miss S. S. Hooper, B.Sc., succeeded the late Miss P. Rawdon as supervisor of the Collection during April 1954, and, assisted by Mr. R. C. Carolin, is now preparing a regional survey of *Dianthus*, which, it is hoped, may ultimately expand into a complete revision of the genus. Mr. Carolin has already published the results of some of his cytological and genetical studies on *Dianthus*, and has accumulated information which is likely to be of considerable value to future workers.

In addition to the large collections mentioned above, valuable material has been received from the following collectors :—

Dr. P. H. Davis (Turkey) ; Dr. C. N. Goulimy (Greece) ; Mr. E. R. Guest ('Iraq) ; Mrs. E. W. Kennedy (Cyprus) ; Mr. J. E. Lousley (Britain) ; Dr. H. F. Mooney (Middle East) and Dr. R. Seligman (Cyprus)—to these, and to those members of the Kew staff who have contributed specimens during the past year, the thanks of the Institution are due.

Tropical Asia. Over 5,500 duplicates were distributed during 1954. About a third of these consisted of the remaining duplicate sets of Siamese plants collected by the late Dr. A. F. G. Kerr ; the rest were duplicates extracted from pre-war collections made by the Forestry Department, N. Borneo. The large collection of Papuan plants made by C. E. Carr, which has long remained only roughly sorted into families, has now been

named generically according to Dr. E. D. Merrill's determinations of the set at the British Museum. This collection is now easily accessible at Kew to workers on particular groups.

Apart from routine naming of collections and general curatorial duties, the genus *Stephania* Lour. is being studied as part of a revision of the Malaysian *Menispermaceae*.

More than 3,000 specimens arrived from Tropical Asia during the year, of which two thirds were Indonesian specimens presented by Herbarium Bogoriense. The rest were sent by the Forestry Department, N. Borneo ; the Forest Research Institutes at Dehra Dun (India) and Kepong (Malaya) ; the Botanic Gardens, Singapore and Department of Forests, Lae (Papua).

Visitors during the year included Mr. J. van Borssum Woalkes, Dr. H. Eichler, Mr. M. Jacobs and Dr. H. Sleumer, all of whom were working on families for Flora Malesiana. Contact with the Philippine National Herbarium was renewed by the visit of the Director, Dr. E. Quisumbing, who came to work on the Vidal collections at Kew.

Northern Asia, China, Japan, Northern India. Selection of material from the Hongkong and Greatrex herbaria for incorporation into the Kew collections has continued. The condition of the Wallich Herbarium, which is of great importance for the study of Asiatic plants and which is arranged according to the Wallich " Catalogue ", was examined in detail during the year. It was looked through sheet by sheet to check the sequence and to effect such minor repairs as might be necessary. The herbarium was found to be in excellent condition. Dr. Horsfield's collection of Java plants, presented to Kew by the Linnean Society at the same time as the Wallich Herbarium, was also examined and arranged to facilitate reference.

The increasing appreciation of the importance of Roxburgh's botanical work to the student of Asiatic botany has led to many enquiries about the plants he described. Roxburgh specimens are to be found in a number of herbaria, but no one institution seems to have a complete set. Whenever possible Roxburgh had coloured drawings made of the plants he described, and they total over 2,500. One set of these drawings is at Kew. Hitherto the plates were scattered through the general Collection of Drawings, but during the past year they have been extracted by Miss Whiting—to whom we are very grateful for this service—and brought together. They are now being checked, and it is hoped eventually to publish a list of them, together with references to the copy of Roxburgh's manuscript of his Flora Indica, which is at Kew.

As is usual a considerable amount of time had to be given to routine enquiries and to the naming of cultivated plants.

During the year a large number of specimens extracted from the Arboretum Herbarium were laid into the general herbarium. Collections of Japanese plants received in exchange from the Arnold Arboretum and National Science Museum, Tokyo, and of Turkestan and Siberian plants received from Leningrad have been mounted and incorporated. A small collection of plants made in Nepal has been received from Mr. C. R. Stoner. Mr. D. O. Witt presented a collection of 61 paintings of

Indian plants made by his wife, Helena Witt, and these have been incorporated in the Collection.

Visitors during the year included Prof. Hara, of Tokyo University, who worked on various Asiatic genera, Miss E. McClintock of the California Academy of Sciences, who worked principally on *Hydrangea* and *Physostegia*, and Dr. Wight of the Tea Research Station, Tocklai, Assam, who worked on *Camellia*.

4,290 specimens have been abstracted from the Arboretum Herbarium.

During the summer specimens of nearly all the *Iris* species and varieties grown in the Herbaceous Dept. were sent in for checking and naming.

Tropical Africa. Once more the work of the staff has been concentrated on the preparation of the " Flora of Tropical East Africa ". The accounts of two families, namely *Turneraceae* and *Chenopodiaceae* have appeared during the year, two more, namely *Connaraceae* and *Canellaceae* have gone to press, and three or four others are nearing completion Meanwhile steady progress is being made on the account of the *Leguminosae*. Mr. J. B. Gillett has almost completed the revision of *Indigofera* and Mr. J. P. M. Brenan is working on the *Mimoseae*, whilst Mr. E. Milne-Redhead has begun to revise *Crotalaria*. Miss E. A. Bruce has unfortunately been interrupted in her work on *Loganiaceae* through illness ; she is, however, making good progress with that most difficult genus *Strychnos*. Mr. J. Lewis is writing an account of the *Rhizophoraceae*, and Mr. J. H. Hemsley, having finished the *Connaraceae*, is now deeply involved in the *Sapotaceae*. Mr. P. Taylor has almost finished an account of the *Primulaceae*, whilst Miss J. Elffers is working on the *Resedaceae*. Dr. W. B. Turrill has completed his account of the *Caryophyllaceae* for the Flora, whilst Mr. R. A. Blakelock, Mr. A. A. Bullock, Dr. R. Melville and Mr. J. R. Sealy have continued to work on the *Celastraceae*, *Asclepiadaceae*, *Gymnospermae*, and *Amaryllidaceae* respectively. Our thanks are particularly due to Mr. I. H. Burkill for the considerable amount of time he has spent on revising the African species of *Dioscorea* with a view to writing them up for the " Flora of Tropical East Africa " and the revised edition of the " Flora of West Tropical Africa ". Specialists at Kew, Messrs. F. Ballard, C. E. Hubbard, E. Nelmes, and V. S. Summerhayes have continued to work on their respective groups for the " Flora of Tropical East Africa ". Outside Kew, help has been received from Monsieur G. Troupin of Jardin Botanique de l'État, Brussels, who is preparing an account of the *Menispermaceae*, and Mr. B. Verdcourt of the East African Herbarium, Nairobi, who has prepared accounts of the *Canellaceae* and the *Alangiaceae*. We are also indebted to Dr. G. Taylor and Mr. R. Ross of the British Museum (Natural History) for undertaking to prepare the accounts of the *Podostemaceae* and *Ericaceae* respectively. It is anticipated that several parts of the Flora will appear during 1955.

The high standard of incoming collections has been maintained, some of the more important having been received from the following :— J. Berhaut (Senegal) ; F. C. Deighton, H. D. Jordan, D. Small (Sierra Leone) ; J. E. Andoh, K. Obeng-Darko (Gold Coast) ; C. F. Onochie and various collectors through the Forest Herbarium, Ibadan (Nigeria) ; H. Callens (Belgian Congo) ; M. N. Harrison, J. K. Jackson, and K.

Wilson-Jones (A.-E. Sudan) ; Miss P. Ellis and H. F. Mooney (Ethiopia); P. R. O. Bally (Somaliland) ; H. C. Dawkins, Miss E. M. Lind, Mrs. E. M. Norman, G. H. S. Wood (Uganda) ; P. R. O. Bally, A. V. Bogdan, P. J. Greenway, Mrs. D. L. Irwin, Mrs. D. R. Tweedie, B. Verdcourt, and various collectors through the East African Herbarium, Nairobi (Kenya) ; W. J. Eggeling, Mrs. H. G. Faulkner, R. E. S. Tanner and various collectors through the Forest Department Herbarium, Morogoro (Tanganyika) ; R. O. Williams (Zanzibar) ; A. de F. Gomes e Sousa, José Gomes Pedro (Portuguese East Africa) ; G. Jackson (Nyasaland) ; H. Wild and various collectors through the Government Herbarium, Salisbury (Southern Rhodesia) ; E. B. Best, D. B. Fanshawe, W. Gilges, Mrs. H. M. Richards, and E. A. Robinson (Northern Rhodesia). Some fine specimens of East African Alöes, together with photographs and notes, have been received from Dr. G. W. Reynolds through the National Herbarium, Pretoria.

In addition, small collections, many of a high standard and very acceptable, have been received from others whose names cannot here be mentioned on account of space. Valuable duplicate material has again been received in exchange from the Jardin Botanique de l'État, Brussels, and Botanischer Garten und Museum, Berlin-Dahlem. Other specimens for naming have been received from the Rijksherbarium, Leiden, which has given to Kew the first set of the fine collection made in Kenya by Dr. R. A. Maas Geesteranus ; from I.N.E.A.C., Yangambi ; from the Imperial Forestry Institute, Oxford, who are presenting a set of plants collected in Northern Rhodesia by Messrs. F. White and A. Angus ; from the authorities of the National Herbarium, Pretoria, who presented a fine set from the Bernard Carp Expedition to Barotseland ; and from the United States National Herbarium, consisting of collections made in Liberia by Prof. J. T. Baldwin, Jr. and in Ethiopia by Dr. P. G. Archer.

In spite of all the revisional work for the " Flora of Tropical East Africa " considerable progress has been made with the routine naming of collections, with the result that the war-time accumulation of specimens from Tropical Africa in the Herbarium store has now almost disappeared.

A large part of the collection made by R. B. Drummond and J. H. Hemsley has now been named and it is proving to be of very great value as many little-known species are well represented in it. This collection must certainly rank amongst the finest ever made in East Africa. The naming of Mr. Gillett's fine collection is also progressing satisfactorily.

During the year, Mr. R. W. J. Keay has made considerable progress with the revision of the " Flora of West Tropical Africa " ; the first part of Vol. 1 appeared in August (see K.B. 1954 : 416) and manuscript has now been prepared for more than half of the second part. Mr. F. N. Hepper, who has been assisting Mr. Keay in this revision, has been working on the *Papilionaceae*.

There have been no changes in the staff during the year. Miss E. M. Stones, Miss A. V. Webster and Mrs. M. O. Milne-Redhead have drawn numerous excellent illustrations for the " Flora of Tropical East Africa ", and the first named has also prepared illustrations for the revised edition of the " Flora of West Tropical Africa ".

During the year visitors working in the Herbarium on problems relating to Tropical Africa included the following :—Mr. C. D. Adams, Monsieur R. Boutique, Prof. P. Duvigneaud, Prof. Dr. A. Fernandes, Sra. R. Fernandes, Dr. P. J. Greenway, O.B.E., Prof. L. Hauman, Dr. O. Hedberg, Dr. F. R. Irvine, Dr. F. A. Mendonça, Dr. J. K. Morton, Mr. H. A. Osmaston, Dr. A. R. Rocha da Torre, Monsieur G. Troupin, Dr. R. Wilczek, and Mr. K. Wilson-Jones. In addition botanists of the British Museum (Natural History), and the Forestry Herbarium, Oxford have paid frequent visits to Kew to work on African material.

Our thanks are again due to the following botanists who have most kindly determined Tropical African specimens for us :—Mr. A. Angus, Dr. C. E. B. Bremekamp, Mr. A. W. Exell, Mr. A. C. Hoyle, Dr. K. H. Rechinger, Prof. R Suessenguth, Dr. G. Taylor, Mr. B. Verdcourt, Mr. F. White and Dr. F. E. Wimmer.

The Secretariat of the A.E.T.F.A.T. has now passed to France and is held by Dr. D. Normand, Centre Technique Forestier Central, 45 bis, Avenue de la Belle-Gabriel, Nogent-sur-Marne (Seine), France The A.E.T.F.A.T. Library, however, is still at Kew under the care of Mr. J. P. M. Brenan. During the year the A.E.T.F.A.T. Index covering the year 1953 was distributed to members. The Association continues to play an important part in co-ordinating the work on Tropical African taxonomic botany.

South Africa. Considerable progress has been made in the incorporation of outstanding collections presented by the Division of Botany, Pretoria and the Bolus Herbarium, Cape Town. The South African liaison botanist, Mr. D. Killick, has dealt with a great number of queries arising from work at Pretoria, particularly in connection with the continuation of the late Dr. J. Burtt Davy's Flora of the Transvaal. He has also been much occupied in the identification of plants from Tropical Africa, particularly the magnificent collection made by Dr. L. E. Codd who accompanied the 1952 Bernard Carp Expedition to Barotseland. He also dealt with smaller collections from Northern Rhodesia (Dr. W. Gilges) and British Somaliland (Mrs. M. White).

A visit was paid to inspect and obtain specimens of *Agapanthus* from the Winchester garden of the Hon. Mr. Louis Palmer ; these will be incorporated and used in a monograph of the genus now in preparation by Mrs. Isaac in Cape Town.

Revisional studies of *Eriospermum* and the South African species of *Myrica* have been commenced by Mr. Killick.

Dr. R. A. Dyer, chief of the Division of Botany, Pretoria was a very welcome visitor during the summer ; he spent some three months working in the herbarium following his attendance at the International Botanical Congress in Paris during July. Other visitors included Prof. Adamson of Cape Town and Mr. R. G. N. Young of Pretoria.

Mr. B. de Winter returned to Pretoria on 11 March and Mr. D. J. B. Killick was seconded to take his place and took up his duties at Kew on 26 February.

America. Several important recent collections of the Forest Department of British Guiana were studied and identified, and a further large

consignment of old sheets from the Jenman Herbarium, Georgetown, which included many duplicates presented to Kew, was dealt with. A number of small but valuable parcels of specimens from Trinidad and Tobago, sent from the Imperial College of Tropical Agriculture, were examined and the late Prof. R. E. D. Baker's manuscript draft of *Euphorbiaceae* for the Flora of these islands was carefully checked. Older collections finally incorporated in the Herbarium included those of C. H Lankester and D. Bourke-Borrowes from remote regions of Matto Grosso and E. Bolivia, while a number of Christopher Sandeman's specimens from Paraguay and Argentina was also dealt with. The American material of the genus *Strychnos* was rearranged by Krukoff and Monachino's revision

Studies of tropical American *Bignoniaceae* included the examination of the entire material from this continent in the possession of the Oxford University Herbarium, of a large consignment from the Herbarium of the Vienna Natural History Museum, and of smaller numbers of specimens from the New York Botanical Garden, Dr. E. Asplund (Stockholm), Dr. H. Fabris (Eva Perón), Dr. H. García-Barriga (Bogotá), Prof. A. Ragonese (Buenos Aires) and Dr. P. R. Reitz (Itajaí, Santa Catarina).

Australasia. Collections were received during the year from the State Herbaria at Brisbane, Sydney and Perth, those from Sydney including a fine set of *Eucalyptus* with a number of duplicate types. A set of 170 specimens collected by Mr. F. L. Hill in Central South Australia to the North West of Woomera, adds to our knowledge of this little known region. An account of Mr. Hill's earlier collection from the Montebello Islands has been prepared and includes several interesting new species. Mr. J. H. Vaughan contributed 160 specimens from the Fiji Islands.

Miss N. T. Burbidge returned to Australia in October after two years at Kew as Australian Liaison Officer. She has recently completed a study of the *Ozothamnus* section of *Helichrysum* and during her stay checked and photographed several hundred type specimens of Australian plants.

An account of the genus *Ranunculus* in Tasmania and South Eastern Australia is being prepared and Dr. R. Melville has completed an investigation of the Podocarps of Eastern Tropical Africa.

Orchidaceae. Many living plants from the Gardens and from outside growers were determined during the year, especially many from New Guinea, communicated by Mr. L. M. Mason. Collections of herbarium material of orchids from all parts of the world were also dealt with, especially from various parts of Africa. These included many on loan from other institutions.

Research has continued on African orchids in connection with the " Floras " of West Tropical Africa and Tropical East Africa. It has been mainly concerned with the genus *Brachycorythis* and other allied genera.

Gramineae. As in previous years, numerous specimens, frequently from areas little known botanically, have been presented to Kew. Whilst many countries of the Old World are represented, the majority of the collections are from Africa, especially the eastern portion of the Continent (A. E. Sudan to Southern Rhodesia and Portuguese East Africa). In

addition to naming large numbers of these specimens, reports on a wide range of problems connected with the *Gramineae* have been supplied to agricultural and other institutions, herbaria and private individuals. These have included information on classification and nomenclature, references to literature, sources of seed supply, grasses for soil conservation, etc. Assistance in checking manuscripts, and in the study of grasses generally have been given to botanists, agriculturists and others from Australia, various African countries, as well as from the British Isles. The incorporation of mounted specimens and the rearrangement of genera after revisions and floras have been continued. Research on grasses has been concerned mainly with the revision of genera and preparation of accounts of them for the " Floras " of Tropical East and Tropical Africa, for which the extensive series of good specimens contributed by collectors in recent years, particularly from Kenya, Tanganyika and Uganda, have proved of great value.

Cyperaceae. Various collections, mostly from Tropical Africa, have been determined during the year. Help has been given to students working on problems in the family.

In connection with the preparation of the Flora of Trop. E. Africa, a revision of African *Hypolytrum* has been completed. The section *Hypoporum* of the genus *Scleria* is also being revised, and this work is nearly finished.

A revision of Indo-Chinese *Carices* is about to be published in a French botanical journal.

Vascular Cryptogams. Research on the ferns of Tropical East Africa has been continued during the year. Valuable assistance in this work has been rendered by the loan of all the fern sheets from the East African Herbarium at Nairobi.

Rather more time than usual has been devoted to taxonomic problems raised by overseas correspondents, notably from India.

The only collection deserving special mention was one of 240 mounted sheets of Japanese ferns collected and presented by Mr. J. Gurney Barclay. It included the type specimen of *Athyrium acutissimum* Kodama as well as representative specimens of many interesting Japanese varieties.

Curatorial work has been largely concerned in the rearrangement of *Polypodium* sens. Hooker & Baker into the segregate genera recognised by Copeland. This has now been completed together with the making of the necessary specific indexes.

Visitors during the year included Prof. R. E. Holttum, Dr. W. A. Sledge, Mr. P. Bell, Mr. C. D. Adams, Dr. R. M. Tryon and Mr. C. V. Morton.

Bryophyta. Work has been concerned mainly with curatorial matters. A large part of the year was spent in the identification and incorporation of mosses from many parts of tropical Africa. In connection with this the help of specialists, in particular that of M. R. Potier de la Varde, is gratefully acknowledged.

Acquisitions during the year include a valuable set of Malayan mosses from Sandakan and the bequests of A. A. Pearson and A. G. Gregor. Other noteworthy collections mounted and incorporated include liver-

worts of the Cambridge Expedition 1947–8 (Nigeria and the British Cameroons) ; mosses and liverworts of N. America and Polynesia ; A. C. Smith's bryophytes from Fiji ; Broadway's collection from the West Indies ; Hesselbo and Jensen's Danish mosses and E. M. Lind's mosses from Uganda.

Miss Taylor was enabled to attend officially the Field Week of the British Bryological Society at Monmouth in April during which she collected many useful specimens. She also attended, as a guest of the Dutch Bryological Society, the September excursion of this Society with headquarters at Venlo. A few days were also spent collecting in the north and a visit to " Hortus de Wolf " in Groningen proved of special interest.

A number of European herbaria were visited during the year and it is a pleasure to record the help received from Prof. Gams at Innsbruck, Mme. Allorge and Mme. Jovet at Paris, Prof. v. d. Wijk and Mr. Margadant at Groningen and Mr. Barkman at Leiden. After the " Paris " Congress a number of distinguished bryologists, especially from America visited Kew and worked for varying periods in the Herbarium. Among these may be mentioned Prof. M. Fulford and Dr. Proskauer.

Fungi and Lichenes. Naming of the Agaric and Discomycete collections made by the mycologist in Trinidad in 1949 was completed during 1954. The agaric flora of Trinidad is the first in tropical America to be sampled as a whole by modern methods and the number of species of agaricales known from the island is now 295 as compared with 58 in 1949. As the work was confined to a single rainy season it is likely that very many additional species remain to be discovered there. Numerous collections of agaricales have been received from West Africa but these are of little value in the absence of studies on the fresh material by a competent specialist. Tentative determinations of dried material, however, suggest that many West Indian species occur in Sierra Leone. A few Agaric and Discomycete collections have also been received from Queensland.

A revision of the British Helotiaceae in the Kew Herbarium has been completed and accepted for publication by the Commonwealth Mycological Institute.

The assistant mycologist has made considerable progress in the monographic study of stipitate species of *Stereum*, mostly of tropical origin. Extensive collections of Polyporaceae and Thelephoraceae have been received for determination from Sierra Leone, the Amazonic provinces of Colombia, Panama and Thailand. Assistance has also been given to the staff of the Forest Products Research Laboratory in the naming of Basidiomycetes from various parts of the world.

A collection of Ascomycetes and Aphyllophorales made by a Norwegian expedition to Tristan da Cunha in 1938 has been named and a report submitted for publication in Norway.

About 740 collections of Basidiomycetes, mostly British, were received from the herbarium of the late A. A. Pearson and incorporated in the herbarium. Two of Mr. Pearson's unfinished manuscripts on British Agaricales have been edited and accepted for publication. A set of 100

Argentine rusts, including 35 species new to the collection, was received in exchange from the Instituto de Botanica Spegazzini, Eva Perón.

Numerous collections of British lichens, mostly by W. A. Leighton, were received from Shrewsbury Public Library. These afforded useful additions to the herbarium and also provided opportunity to prepare several desirable sets of duplicates for exchange.

Kew collections of the British stipitate Hydnaceae have been revised by Dr. Maas Geesteranus.

Overseas visitors working in the Department during the year included Dr. R. Singer, on tropical American Agaricales, Dr. J. W. Groves on Discomycetes and Dr. S. J. Hughes on Hyphomycetes.

The assistant mycologist attended the Spring Foray of the British Mycological Society in the Lake District and assisted at a number of autumn forays of this and other Natural History societies in the home counties.

Algae. In the course of the past year several valuable additions have been made to the herbarium. Gifts include : From Professor Rayss of the Hebrew University of Jerusalem a set of beautifully prepared specimens from the coast of Palestine, an area little known algologically and very sparingly represented in most herbaria ; from Dr. M. A. Pocock of Capetown a collection of South African parasitic Florideae, also a series of fertile specimens of two deep water species of *Gelidium* described in K.B. No. 4, 1949 and hitherto known only from the type material ; from the Public Library at Shrewsbury 33 specimens of Dr. Welwitsch's " Phycotheca lusitana ", a complete set of Wyatt's " Algae Danmoniensises ", 68 marine algae from Georgetown, Tasmania shown at the Exhibition of 1851, a small collection made by William Thompson in Northern Ireland, and finally 44 sheets of *Charophyta* ; from Miss Bertha Hedley, British Columbia, a volume of 273 paintings of British algae neatly executed by her great uncle, the Yorkshire botanist James Ward ; from Miss Margaret Grubbe a small album of marine algae mostly from Sidmouth and apparently collected by Catherine Cutler.

Collections received for naming included one made by Dr. R. Melville on his recent tour of Australia, and one made by Messrs. Drummond and Hemsley in East Africa. The latter is particularly interesting as we have very little material from this area. A small collection from Malaya added several species to the herbarium.

Dr. P. C. Silva of the University of Illinois is revising the genus Codium and has had the whole of our material on loan. Dr. G. F. Papenfuss, of the University of California, spent a week in the herbarium on his way back from the International Congress in Paris.

Spirit Collections. Additions to the collections during the year numbered over 1,200, an increase of about 200 over the previous year. The specimens included the greater part of the large collections made in East Africa by Messrs. Drummond and Hemsley, in addition to many other African gatherings. The chief families represented were the *Orchidaceae*, *Acanthaceae*, *Asclepiadaceae*, *Cucurbitaceae*, *Euphorbiaceae* and *Liliaceae*. Rearrangement of the collections was continued as time allowed.

Carpological Collection. There have been a large number of additions laid in and the problem of space is becoming very acute.

Fumigation Apparatus. The large fumigation chamber was used on 17 occasions during the year ; the small chamber on 36 occasions. It was found necessary to fit a new motor to the small chamber early in the year, while the gas proof heaters in the large chamber were found to be in a dangerous condition early in December. New heaters were about to be fitted at the time this report was prepared. No outbreaks of insect attack were reported during the year.

Index Kewensis. Work has continued on the compilation of Supplement 12.

Nomenclature. There was considerable activity during the early part of the year in preparation for the International Congress in Paris ; the pre-Congress meetings of the Nomenclature Section were held under the chairmanship of Prof. Rousseau from June 28–July 1 and were attended on behalf of Kew by Mr. A. A. Bullock.

Routine nomenclatural queries from all over the world continue to arrive in a steady stream ; even the simplest of these often involve considerable bibliographical research and it is abundantly clear that most non-taxonomists do not appreciate the difference between taxonomy and nomenclature. Every effort has been made to meet the requirements of correspondents, but it cannot be too strongly emphasized that the mere checking of lists of names is a useless labour unless the names are supported by voucher specimens.

Botanical Magazine. Parts 1 and 2 of volume 170, N.S. tt. 220–241, edited at Kew by Dr. W. B. Turrill for the Royal Horticultural Society were published in 1954. Of the 22 articles, 18 were contributed by members of the Herbarium staff and the preparation of these necessitated a great deal of original research. The President and Council of the Royal Horticultural Society have presented the originals of the coloured plates and of the black and white text figures to the Kew Herbarium.

The Library

Inquiries for information of a biographical and bibliographical nature have been as numerous as in other years, and, as usual, have been dealt with in addition to the normal routine work of the library. With the continuation of the special grant for arrears of binding many volumes needing attention were bound or rebound.

Work on the new loose-leaf copy of the Index Kewensis has been completed and the whole work is now available for consultation in its new form.

Work has been continued in the preparation of the subject catalogue and greater progress made possible by an addition to the library staff in July. The titles of many papers of scientific interest have also been added to the classified index.

Loans have again been made throughout the year to other Government Departments and Agricultural Bureaux and a number of publications have been borrowed from time to time from other libraries for the use of members of the staff.

We are again greatly indebted to various authors, members of the staff and others for books generously presented to the library. As in former

years publishers have presented many publications for review in the Kew Bulletin, while many periodicals have been sent to us in exchange for the Kew Bulletin and Hooker's Icones Plantarum. Other publications have also been received in exchange for duplicates.

Valuable contributions have been made to the library by many societies, academies and similar institutions both at home and abroad. Reprints of botanical papers have been presented to the library by members of the staff and many other authors.

The Ministry's Photographic Department has again provided us with photostat copies of valuable publications. Further additions have been made to the collections of maps and drawings through the continued generosity of the War Office, Ordnance Survey, and other donors.

Department of Economic Botany

Museums of Economic Botany.

The identification of economic plant products from various parts of the world and the supplying of information on economic plants occupied a large amount of time as in previous years. Among tropical and sub-tropical crops a number of enquiries were dealt with in connection with the following—cinnamon, ground nuts, sesamum, raffia, balsa, senna, sansevieria, capers, opium poppy, aloes and patchouli. Several enquiries were received in regard to *Rauvolfia serpentina* Benth. and its present day uses. Other medicinal plants and spices that were the cause of enquiries during the year were *Duboisia*, *Testudinaria*, pepper, ginger, vanilla and cardamoms. The existing high prices for tea and coffee resulted in a number of enquiries about the possibility of growing these crops in areas were they have not hitherto been grown.

Other miscellaneous enquiries have been concerned with the following. The identification of seeds and fruits from various archaeological excavations, mainly in the British Isles. One of these proved to be a walnut (*Juglans regia*) and may be the earliest record for a walnut in Britain, being said to date from the first century A.D. Unusual impurities found in Indian tea proved to be seeds of *Melothria* sp. Fruits used for lathering in Ethiopia were found to be those of *Phytolacca dodecandra* L'Herit. A gourd, of a kind which had made several people ill when eaten, was found to be a form of *Cucurbita pepo* var. *olifera* (L.) Bailey, a variety that includes several of the cultivated ornamental gourds. A plant, identified as *Diplotaxis tenuifolia* (L.) D.C., was alleged to have been collected by Pakistani engine room crews near Tilbury and to have been used by them as food, being chopped up, boiled in water with sugar and eaten with curry. The plant is used as a salad plant in parts of southern Europe. Various enquiries received about the skeletonizing of leaves, a popular hobby in Victorian times, suggests that there may be a revival of interest in this subject. Enquiries have continued to be received on common names and on the legends and folk lore of a number of different plants. The use of plants and flowers on postage stamps also attracts interest and has been the cause of a number of enquiries.

The nomenclature of Conifers in the " Guide to the National Pinetum and Forest Plots at Bedgebury " was checked and revised for a new edition of the Guide now in the press.

A large collection of Malayan woods consisting of some three thousand hand specimens, was labelled and incorporated in the main collection during the year. These specimens were supplied by the Forestry Department in Malaya and corresponding herbarium material exists. They constitute a valuable acquisition. The collection of East and Central African woods was also considerably augmented by specimens received from Kenya, Uganda and Southern Rhodesia.

The installation of modern electric lighting throughout No. 1 Museum now ensures adequate light for all the exhibition cases, as well as the reference collection, and is fully appreciated by the general public. The interior decoration of the cases in this building has also been completed. Replacement of perished or worn out linoleum in three of the Museums was carried out during the year. Some of this had been down for over forty years and replacement was long overdue.

Introduction and Distribution of Economic Plants.

Following the retirement of Sir Geoffrey Evans at the end of 1953, Mr. T. A. Russell, B.Sc., A.R.C.S., A.I.C.T.A. was appointed on 1st June to supervise the work of the Quarantine House and matters concerning tropical crops. Mr. Russell previously served in the Colonial Agricultural Service, as Plant Pathologist and later as Director of Agriculture, Bermuda, and then as Senior Agricultural Botanist, Nigeria.

The function of the Quarantine House is, so far as possible, to prevent the spread of diseases and pests during the transference of useful plants from one part of the Commonwealth to another. To this end, plants from the one country are held under observation at Kew for a suitable length of time and are then propagated vegetatively so that daughter plants, apparently healthy and free from any pest, become available for distribution to other territories. Varieties of cacao from the Imperial College of Tropical Agriculture occupied most of the space during the year. These included the most promising of the Imperial College selections of Trinidad trees and some Amazonian Forasteros originally collected on the Upper Amazon. Cuttings from these plants rooted during the year were sent by air to the West African Cacao Research Institute, Gold Coast, and to the Departments of Agriculture in Malaya, Ceylon, and Fiji. The young plants, packed in damp moss and polythene, travelled well and are understood to be growing successfully in their new surroundings, with the exception of a consignment sent to Malaya.

In the latter part of the year there came, also from Trinidad, material of *Theobroma* and the related genus *Herrania* which was collected by the Expedition to Colombia in 1952 and which is now on its way to West Africa for the use of plant-breeders there. The propagation of this collection will strain the capacity of the quarantine house and, in order to improve the speed and certainty of rooting of cuttings, electrical heating has been provided to maintain the rooting medium at a constant optimum temperature.

Bananas and plantains from the West Indies also occupied some space in quarantine. Suckers of the variety Lacatan were sent to the Cameroons during the year, and other varieties are being grown for trial in

Queensland. Plants of six varieties of cotton resistant to blackarm disease and obtained from Uganda and the Sudan, were grown. They fruited freely under glasshouse conditions and seed from them is being forwarded to the Department of Agriculture, Cyprus.

In addition to this quarantine service, assistance was given to countries of the Commonwealth in obtaining other plants of potential value. Young plants of ipecacuanha (*Cephaelis ipecacuanha* Rich.) were sent to the Departments of Agriculture in Nigeria, British Honduras, and Malaya for purposes of trial in their territories. A consignment of young plants of several different species of *Arachis* was sent to a French source for subsequent despatch to ground nut growing areas where it is understood they may be used in breeding work.

Attempts at raising Brazil nut seedlings (*Bertholettia excelsa* Humb. et Bonpl.) from newly imported nuts obtained from a commercial source did not meet with much success. Various forms of treatment (cracking, filing, etc.) were applied to the nuts but after eight months only 3·9% germination had been obtained. It is possible the nuts were older than they were believed to be. Freshly gathered nuts obtained direct from Trinidad have now been sown which it is hoped will give better results.

Jodrell Laboratory

Research concerning the systematic anatomy of the Monocotyledons has been continued throughout the year. The Keeper has examined microscope slides of many additional grasses, and has indexed information concerning their anatomy. Arrangements for publication of a three-volume work on the anatomy of the Monocotyledons of which the first will treat of the Gramineae have now been made with the Delegates of the Clarendon Press at Oxford.

Dr. M. Y. Stant has continued her researches on the anatomy of the Alismataceae and related families, an account of which is in preparation. About 30 slides illustrating this have been added to the permanent collection.

During the early part of the year and in August, Mr. P. B. Tomlinson of Leeds University continued his work on the anatomy of the Zingiberaceae. He has added to the permanent collection about 200 slides representing 40 species belonging to 19 genera.

About 130 routine enquiries have been dealt with during the year, and these entailed the microscopical examination and identification of about 330 specimens and samples of miscellaneous botanical material. The most numerous items have included timbers, archaeological specimens, and rubbed and powdered herbs. Some of the more unusual samples have included the following. (i) A number of nylon bobbins examined on behalf of the Board of Customs and Excise. (ii) Some twigs of alleged apple trees, most of which proved to be plum suckers, and which were submitted by the laboratory at New Scotland Yard. (iii) Unsatisfactory pick handles which were found not to have been made of the timber that had been specified. Many of the wood specimens and other miscellaneous items have been identified by Mr. Richardson and the identifications confirmed by the Keeper. Herbs, seeds, roots and a few

timbers have been dealt with by Dr. Stant. For the first time an enquiry was received concerning the possible ill effects of fumes from a proposed underground car park in a London square on the adjacent vegetation.

Mr. Richardson and Miss Catling have, between them, prepared the following slides for the reference collection. Over 200 slides of 75 species of Gramineae ; 140 slides representing 35 species belonging to 9 genera of Cyperaceae ; slides of 80 wood specimens, including various exotic trees and shrubs from the tropical and temperate departments in the gardens. They have also collected from the gardens, and fixed for anatomical investigation, many species of Agavaceae, Araceae, Bromeliaceae, Liliaceae, Marantaceae and Palmae. Three thousand samples of Malayan timbers have been sorted into their respective families ready for incorporation in the museums.

The Keeper attended the 8th international botanical congress at Paris as an official representative of Kew. During the congress he delivered two general reports on " Recent Advances in Taxonomy as seen by an Anatomist ", and " Recent Work on the Anatomy of the Monocotyledons with special Reference to Investigations at the Jodrell Laboratory at Kew ". He served as a vice-president of the section of the congress concerned with the anatomy and morphology of plants, and attended a few of the meetings of the " International Association of Wood Anatomists " that were held during the congress. Visits were paid to the " Centre Technique du Bois ", and the French national arboretum at Les Barres.

The Keeper served on the Crude Drugs Committee appointed by the British Pharmacopoeia Commission to assist in revising the British Pharmacopoeia. The work of the committee started only towards the end of the year.

The Gardens

Like 1953 the year was notable for the very wet weather experienced both in early spring, mid summer and late autumn, with the result that whilst the total rainfall of 27·31 inches was of considerable assistance to the whole of the plants out of doors, it had the effect of making maintenance work much more difficult. June, July and August were remarkably wet months with a total rainfall of 10·24 inches of which quantity 4·2 inches fell in June. April was the driest month of the year with ·41 inches of rain, and during the early part of the month there were several hard frosts followed by 10 to 14 days of cold winds. Visitors decreased in number by 101,650.

Temperate House

During the year much needed repair work was carried out. Another chimney has been rebuilt, most of the ventilating gear is in working order again, drip from the main roof is much reduced and a convenient tool shed has been erected in the house.

The resoiling of a previously badly drained bed at the north end of the centre block was completed early in the year, to the great benefit of the tree ferns and other plants now established there. Similar work on a bed in the Himalayan House is now in progress.

In the propagating section there has been an increase in the number

of plants raised from seed. 780 items have been sown, of which about one third were collected in Australia by Dr. R. Melville.

For the fifth successive year, there has been an increase in the number of species from which seed has been collected for distribution, the number having increased sevenfold over that period. In part this reflects an improvement in the collection of temperate plants since the war, and in part it is due to the erection of the Australian House where many plants find growing conditions more congenial than in the Temperate House. The amount of seed available for exchange from this Department will never be great, as many plants fail to flower in cultivation here, and of those that do, only a moderate number produce viable seed.

The number of plants referred to the Department for naming was 199 in 1954, compared with 286 in 1953. Material of six plants which flowered during the year has been supplied for figuring for the Botanical Magazine, viz. *Columnea* × *banksii*, *Rhododendron inaequale*, *Echium pininana*, *Luculia grandifolia*, *Caiophora tucumana* and *Hebe macrocarpa* var. *latisepala*, and other material has been supplied for anatomical, biochemical and cytological investigations. Among other plants which flowered during the year, mention may be made of *Hakea laurina*, *Eucalyptus leucoxylon* var. *rosea*, *Hymenosporum flavum* and *Lagunaria patersonii* in the Australian House ; *Encephalartos altensteinii* which produced the male cones, *Iris speculatrix*, *Hidalgoa wercklei*, *Luculia pinceana* and *L. gratissima* in the Temperate House ; and *Amicia zygomeris* on the border surrounding the Temperate House. The last named plant is usually cut by frost before it can flower, but the mild autumn was in its favour, and the absence of bad fogs permitted the flowering of the Luculias which in recent years have dropped most of their buds from this cause.

Decorative Department

The main feature during the spring was the display of Darwin, Breeder and May flowering Tulips to be seen on the Palm House Front. Several new varieties were introduced forming an interesting colour scheme rather distinct from that used in previous years. Unfortunately hard frost in early February was responsible for the death of the winter flowering Pansies which left many gaps in the ground work used for Tulips. One variety Celestial Queen did not suffer, due possibly to its extra vigour. Aubretias also suffered badly, so much so that the majority of the stock was lost and it will necessitate two or three years hard work to build up a new stock for use in this way.

The summer bedding was much admired by visitors as the dull wet summer season was particularly favourable for the display of Begonias on the Palm House Front. Subtropical plants used in the same scheme did not like dull and damp conditions and made very little growth throughout the summer. On the Broad Walk and in the beds by House No. 4 Pelargoniums were used with success though damping off was prevalent in the later months of the season.

After a lapse of many years the regional beds between Houses No. 4 and 5 were planted with species from North and South America, South Africa, Australia and the Mediterranean Region, and despite the poor growing conditions the plants flowered well, especially the South African representatives.

Roses in the Rose Gardens showed a marked growth improvement from periodical dressings of artificial manures assisted by the annual mulching with coffee residue.

Conservatory

The seasonal displays in the Conservatory were if anything of a rather higher standard than usual, apart from a partial failure with the early forcing plants which, owing to lack of previous cold weather, did not bloom as freely as they usually do. The stock of forcing material has become depleted and attempts are being made by the raising of plants in the nursery to strengthen this part of the work. Large batches of Cyclamen, Primulas, Cinerarias, Streptocarpus, Calceolarias and Pelargoniums helped to make a colourful display in the cool section of the house, whilst in the warm section various winter flowering Begonias were very good. An interesting exhibit has been the introduction of a batch of mixed varieties of *Bouvardia*, a plant which was formerly in great favour.

Plumbago rosea and *Coleus frederici* owing to the absence of fog in November and December gave a far better display than has been possible at Kew for many years, but the Chrysanthemums which normally form the principle exhibit, suffered very badly through excessive drip from the roof. In late December the old putty on which the glass was bedded was cleaned off and replaced with a new mastic joint sealer and waterproofing compound, and it is now hoped that growing conditions will be very much improved.

Melon Yard

In December the roof of House No. 20 was stripped, the iron framing cleaned of rust and after being given a coat of protective paint new lights were incorporated in both roof and side. Two aluminium experimental houses have been completed, one of which will be available for the Decorative Department. It occupies a site immediately north of the Banana House and adjoining House 21a.

Arboretum

The wet summer and the favourable conditions generally, proved very satisfactory to the growth of trees and shrubs, whilst new plantings made last winter, became established without difficulty. Only on a few occasions were water hydrants in use. The growth of grass was also phenomenal and at no time did the lawns become dry and brown. Mowing became a major operation and there was no respite from spring to autumn. It is during such times, that the value of carrying out repairs by direct labour can be appreciated. On a number of occasions where a machine had broken down during the afternoon, the artificer made the necessary repairs and adjustments to enable the machine to be ready for service the following morning or even the same day.

Although losses amongst the older trees continue, they are not so heavy as a few years ago. Altogether 10 large trees have been removed because of their dangerous condition. In addition a number of smaller trees were removed to allow space for new planting. The very large Elm near Cumberland Gate, which for many years has been a source of anxiety, has been taken down. It is one of the largest trees to be removed

for years, and the men responsible for carrying out the work are to be congratulated on a difficult operation successfully accomplished. The gales during the early part of December caused the loss of two valuable trees, i.e. the largest specimen of *Sassafras officinale* near to the Temperate House, and also the large *Paulownia tomentosa*. The latter, although not a healthy specimen, had for a number of years given exceptional displays of flower each spring. Many years will elapse before one of the younger trees will reach similar proportions and flower with the same freedom.

The general display of flowering trees and shrubs was again very good, but frosts during the early part of April, followed by cold winds seriously interfered with the flowering of the early Rhododendrons, especially in the King William's Temple area, otherwise the displays of large flowered Rhododendrons, the " Azaleas ", Magnolias, Japanese Cherries, *Prunus* and *Malus*, were all above the average. Outstanding among the Magnolias, was the large specimen of *M. campbellii* near Unicorn Gate ; the tree producing over 130 of its brilliantly coloured blooms. *M. salicifolia*, *M. watsonii* and *M. mollicomata* also bloomed freely, whilst *M. soulangeana*, in its various varietal forms, and also the large specimen of *M. veitchii* in the Duke's Garden, flowered profusely.

Also noteworthy were the *Hamamelis mollis* in the collection just off the Holly walk. *Viburnum grandiflorum* flowered freely in the open near King William's Temple, proving that it does better than when planted on a wall. The hybrid *bodnantense* 'Dawn', continues to show great promise and the specimen near the chalk garden flowered freely, and over a lengthy period. In common with previous years, *Prunus subhirtella* var. *autumnalis* proved a great attraction, the trees being covered with the fragrant pinkish white semi-double flowers.

A newcomer to Kew—*Magnolia ashei*, produced its first flower, and should prove an acquisition.

As in former years, the collections of *Philadelphus* and *Deutzia* flowered freely. Good displays of Hydrangeas and the varieties of *Hibiscus syriacus* proved popular, and their value as late-summer flowering shrubs cannot be overestimated.

Noteworthy additions to the collections included the following : *Corylopsis himalayana*, *Malus robusta*, *Hamamelis mollis var. pallida*, *Syringa tigerstedii*, *Lindera biloba*, *Acer tschonoskii*, *Berberis bergmanniae*, *Rubus tibetanus*, *Camellia rusticana*, *Potentilla fruticosa*, *var. waltoniensis* and *Stephenandra crispifolia*.

A further addition to the collection of Camellias along the eastern boundary of the gardens and opposite to the Flagstaff, was made during the early spring. The new planting includes the various varieties of *C. williamsii* and also various new hybrids of American origin (chiefly C. saluensis × japonica). This collection of Camellias, together with those in the Cumberland Gate border, includes over 100 different varieties, whilst others in the Arboretum Nursery not yet planted out, bring the total to over 130. Many of the specimens planted seven years ago, are growing freely and provided a fine display. Public interest in the Camellias has increased greatly in recent years.

A certain amount of replanting of the shrubberies around King William's Temple was carried out during the autumn, and much further

work is contemplated where overcrowding has taken place. The border containing the collection of *Calluna vulgaris* and its forms and varieties was overhauled, enlarged and replanted, but in order to prevent the young plants being eaten by rabbits, a surround of wire netting has been necessary. In spite of continued action, by shooting, trapping and poison, rabbits continue to be a serious menace, especially to young plants in the Arboretum Nursery. It is hoped to wire the nursery in entirely to prevent young and valuable plants from being ravaged.

New mechanical equipment purchased during the year included a Rotary Hoe, which has already rendered valuable service in the Nurseries and also with the preparation of beds and borders in the Decorative Department. A new 24 inch Motor Mower was received during early June, and at a time when lawn mowing was one of the urgent tasks. This machine replaced the old model that had been in service for over 20 years.

A Trailer Seat and Hay Rake was also obtained for use with the Motor Scythe.

A good deal of additional equipment has been purchased for the machine shop and artificer's use, including a Compressor with various attachments, also cylinder-boring equipment. It is now possible to carry out a complete overhaul of a machine without outside assistance.

New structures in the Stable Yard include a Dutch Barn for the storage of hay, and a large galvanised and steel shed for storage of equipment and materials. An oil storage shed of brick and concrete has also been erected.

Although the year was not ideal for seed collection, seeds from 75 different natural orders (Families), 235 genera and over 1,500 species were collected, this being well up to the average for previous years. From the beginning to the end of the year, 5,651 packets of seeds were distributed, this again being an increase on the previous year when 4,952 packets were sent out. In addition 55 consignments of living material were sent to Botanic and other Scientific establishments at home and overseas.

Specimens of trees and shrubs referred to the department for identification during the year numbered 674, the highest number for one day comprising 31 conifer specimens.

The cold room and refrigerator installed last year is now in use and galvanized trays for those seeds that require cold storage obtained. Seeds of oily or mucilageous nature, and others, will, it is hoped, be stored with every success, and thus enable many subjects to be sent out that it was previously impossible to keep in a viable condition for any length of time. Experiments with stratification are also being conducted.

The treating of the Holly Walk path with cold Asphalt was completed during May and June, and the general condition is greatly improved. It is hoped to continue with a further section of the Princesses Walk during 1955, and so gradually reduce the necessity for ordinary spraying with Bitumen and chippings.

The wet autumn and winter of 1954 broke up the tarred surface of a

number of the paths, especially those which have not been resprayed for several years.

Labour difficulties continue and the lack of the right type of man is very evident. During the year there have been 15 changes in the Arboretum Staff.

The leaving of Miss Chaplin and the death of C. A. Hopkins has necessitated a curtailment of the index work and the keeping of up-to-date records concerning the height and girth of trees.

Experiments have continued with the composting of grass mowings, leaves and coffee residue, aided by the use of Malt Dust and Nitro-chalk to assist breaking down of the materials. The results obtained by composting the three materials together, in long narrow heaps are very satisfactory, especially where Nitro-chalk has been used. Allowing for labour, the cost of composting is not excessively high, and a lot of good compost is available for use in the various beds and borders.

Alpine and Herbaceous Department

With the very mild weather continuing until well after Christmas many of the early flowering subjects and other plants were starting into premature growth, while for other subshrubby or woody plants this very unusual mild spell did not allow them correct ripening which they are usually subjected to, to withstand the very cold periods.

As one would expect this had serious consequences when in the later half of January and early February the weather changed to very severe cold icy winds and hard night frosts, which killed a very large variety of plants both in the Rock Garden and the herbaceous ground.

Many of the plants which succumbed to this cold spell were the half hardy types which are native of Mediterranean Regions, California, S. Africa and other milder parts of the globe, but it also killed off and severely damaged many of the so called hardy plants which have withstood other more severe winters in the past.

This early setback was followed by a sunless summer which was comparatively wet with very cold nights, causing many of the annuals and biennials normally grown in the natural order beds, to fail to germinate, whilst others germinated but never grew out of their seedling stage, while those that did grow were very stunted and in some cases failed to flower at all.

These climatic conditions continued throughout the summer and autumn greatly interfered with the collecting and harvesting of seed. With many, the number of seeds available are few, whilst with others particularly those late summer flowering, no seed was formed or failed to ripen, through lack of sun.

The cold wet season was ideal to some plants especially those requiring plenty of moisture during their growing season. Many of the bog Primulas, Gentians, Meconopsis, Lilies and *Cyananthus* grew particularly well, but failed to produce much seed.

Special mention should be made of the very fine group of *Meconopsis betonicifolia* which for once excelled themselves.

Rock Garden

A further section of the Rock Garden at the North end which was originally built with Purbeck limestone is now being cleared and reconstructed using Sussex sandstone to conform to the general layout of the North end of the Rock Garden.

The effect of the cold spell last winter on plants in the Rock Garden necessitated much replanting during the summer, at the same time it gave an opportunity of renewing the soil in many of the pockets, which were badly in need of attention, as drainage in some was bad.

Plants generally in the Rock Garden and particularly those on the reconstructed sections of previous years, where new soil had been added, put on a considerable amount of growth. There were very few occasions this summer when artificial watering was required, and newly planted seedlings had a good opportunity to become firmly established.

Mention should be made of a few of the many outstanding plants which flowered well this past season. *Potentilla arbuscula* with its large yellow flowers, probably the best of all the fruticosa section, flowered for a very long period throughout the summer and autumn. *Gentiana sino-ornata*, a late flowering species was very good with its large deep blue flowers. *Roscoea cautleoides* var. *grandiflorum* an extremely good large flowered form, *Digitalis dubia*, a very charming dwarf pink flowered foxglove, *Viola cornata* var. *alba* flowered for a very long period throughout the summer. *Adlumia cirrhosa*, an interesting climbing plant belonging to Papaveraceae, *Condonopsis meleagris*, a unique plant from W. China, with purple mottled bell flowers. *Synthyris stellata*, a beautiful North American plant and *Polygonum subscaposum*, a recently introduced plant by Ludlow and Sherriff who sent home seed from Bhutan.

Among some of the more interesting and unusual plants which flowered in the alpine house were the two early flowering *Rhododendron leucaspis* and *R. pemakaense*. Specimens of *Primula forrestii*, *Cassiope lycopodioides*, the dwarf, *Lychnis alpina*, *Geranium subcaulescens*, *Primula farinosa* and several dwarf species of Narcissus including *N. rupicola*, *waterieri*, *triandrus* var. *concolor* and *N. aurantiaca* flowered particularly well.

In the Alpine propagating section, two new large wooden portable propagating frames each divided off into four separate sections were constructed on the staging on one side of House 25A. These were a great improvement over the old brick type outside, as they retained the sun heat and moisture much longer and 90 per cent. of cuttings rooted.

Hundreds of plants from the Rock Garden and order beds were propagated by vegetative means. Experiments were carried out during the season with the use of " Polythene ", as a means of aiding the propagation of certain types of Alpines and Herbaceous plants. Results show that plants with silver on woolly foliage rot off very rapidly through excessive moisture being retained under the polythene, and further work requires to be done before any definite assessment can be made.

The department supplied a considerable amount of flowering material for figuring in the Curtis Botanical Magazine such as *Ranunculus ficaria* var. *aurantiaca* (T 226) a most interesting colour variation of the lesser celandine which was the only one originally found in a field near Windsor,

Berks amongst a batch of ordinary yellow flowered plants ; *Vicia canescens* (T 233) originally raised from seed which was collected by P. H. Davis in the Lebanon growing on limestone scree ; *Felicia pappei* var. *gracilis* the plant which for so long has been known in gardens as *Aster pappei*, a very useful bedding plant and a good subject for the cool house ; *Rudbeckia speciosa* (T.238) a very good late summer flowering plant from Eastern N. America suitable for herbaceous borders ; *Convolvulus pitardii* var. *leucochnous* a beautiful trailing plant, seed of which was collected and sent to us by M. Jean Gattefosse in 1949 from Morocco.

Good flowering spikes of *Lilium Davidii* were exhibited at the Royal Horticultural Society's Hall and received a First Class Certificate. This is a very beautiful and easily grown lily, native of Western China.

The Iris Garden, now containing a good collection of modern varieties gave a very good and colourful display of flower during the season, which was much prolonged by the cool, dull weather prevailing at the time.

A new rectangular bed has been constructed at one side of the Iris garden, in preparation for the planting of Iris species. These have been checked when in flower during the year with the co-operation of Mr. Sealy from the Herbarium.

A large horsechestnut tree occupying much useful ground has been taken down on the border where the Hosta collections have recently been planted. The ground is to be manured and trenched and then planted with large informal groups of Hemerocallis spp. and clumps of Lilies, interplanted with a few young birch and oak tress which, it is hoped, will in time provide sufficient light and shade for the well being of the lilies.

Specific names in the genus *Hosta* were checked by Dr. Nils Hylander of Uppsala who has made a special study of the genus. The usual large numbers of seeds and plant material have again been received in this department during the course of the year, including a most interesting collection of seeds chiefly from native localities in Oregon, N. America, such as *Lewisia* spp., Dodecatheons, *Darlingtonia californica* and many uncommon hardy ferns.

Plants of *Streptocarpus pusilla*, a very interesting miniature of S. Africa, were received from Mrs. Garnett, Botfield. A. W. Weeks of Limpsfield Common sent in seeds of New Zealand plants which included *Leptospermum nanum* which has just come into cultivation. Although there is a great variation in the seedlings in both habit and growth very few if any have the dwarf appearance. Other items were *Ranunculus lyallii*, a very difficult plant to grow, *Celmisia* spp., Myosotis and *Wahlenbergia* spp. From St. Moritz B.G. came a very good collection of Alpine seeds which had been collected from known stations in the Swiss mountains.

A large collection of Celmisias, Acaenas, and *Ranunculus* spp. were received from Christchurch B.G. ; many of these have already germinated satisfactorily.

The Blue Ridge Nurseries of North Carolina sent us many beautiful clumps of plants which included Cypripediums, Trilliums, *Chelone* spp. and hardy N. American ferns, these all arrived wrapped in polythene bags in excellent condition.

To add to our already large collection of Iris, Dr. L. F. Randolph

of Cornell University, sent us many new dwarf types which he had collected personally in Southern France and Northern Italy, whilst another small but interesting collection was received from Prof. J. Straub of Cologne B.G. Many seeds, cuttings and plants were also received from Cambridge, Edinburgh, Glasnevin Botanic Gardens, and the Royal Horticultural Society's Gardens, Wisley.

During the year 5,220 packets of seeds were distributed to various botanical and other horticultural institutions throughout the world which included a certain amount of living material for experimental and research work.

Tropical Department

Palm House

This house remained closed to the public throughout the year. The work which the Ministry carried out in the latter half of the year on the glass roof has greatly improved the heating and atmospheric condition inside the house, which are essential to the well being of the valuable collection of plants.

A number of the large specimen Cycads which had overgrown their tubs, were moved on into large square tubs provided by the Ministry of Works.

No. 15 *House*

The Tropical Water Lilies flowered profusely during the summer months. Many of these plants were raised from tubers received from Mr. G. H. Pring, Missouri Botanic Garden, early in March. The two large specimens of *Acalypha hispida*, which had been grown on for the second year, provided a great attraction with their long bright red tails. Other plants of interest which flowered freely were *Beaumontia grandiflora*, *Nelumbo nucifera*, *Hibiscus schizopetalus*, and *Triplopogon ramosissimus*.

Ferneries

Throughout the summer and autumn months, the staff have been busy in propagating many of the permanently planted Ferns, lifting, potting and tubbing up many of the large specimen Angiopteris, Cyatheas, Dicksonias, etc., in readiness for the rebuilding operation, which is due to commence early in 1955.

Much valuable material was received during the year. This material was donated by Dr. Sledge and T. G. Walker, Ceylon. Prof. R. E. Holttum, Singapore, Achimota University, Gold Coast and spores from C. A. Schelpe, Cape Town.

We have been successful in raising new and difficult Ferns from spores this year, e.g. *Sadleria cyatheoides*, *Cheilanthes multifida*, *Hemitelia capensis*, *Pityrogramma pulchella*, *Blechnum punctulatum*.

No. 5 *Succulent and Cacti House*

During the summer many of the large Aloes, Euphorbias, and Cereus, which were permanently planted out, had to be lifted, potted and tubbed up in readiness for the rebuilding of this house. In the middle of September we commenced clearing the plants from No. 5 house. The

large specimen Agaves were taken to the Temperate House, and staged on each side of the middle entrance doors. The large Aloes, Euphorbias, Cereus, Phyllocactus etc. which require more heat were housed on the middle N. West grating in the Palm House. The smaller plants were all housed in No. 7 and the Sherman Hoyt houses. By the last week of October, No. 5 house was cleared of all plant material in readiness for the builders to operate on November 1st. At the end of the year the house was still empty awaiting demolition by the builders.

No. 1 House. At the end of the summer the Ministry of Works renewed several of the side lights, which were badly decayed, and at the same time part of the interior woodwork was repainted.

Orchid Houses

In House 13A the timbers on which many of the epiphytic Orchids are growing have had to be renewed and a number of new Dendrobiums were used to replace some of the older specimens. Despite the lack of sun this summer, there was a good display of blooms throughout the season.

In early January we had one of the finest displays of *Laelia anceps*, and varieties, no doubt due to the plants being grown near the glass thus gaining the maximum amount of light to ripen up the pseudo bulbs the previous summer. The plants were staged in the cool show house and the flowers remained in good condition over a long period.

During the year over twenty five new Orchid species were added to the collections, these were donated by Messrs. K. E. Baseley, Siam, C. H. Lankester, Costa Rica, H. W. Simmonds, Fiji, J. O. Wright, Nigeria, D. Westwood, Gold Coast, A. J. Woodruff, Manila, and F. Kingdon-Ward.

T. Range

House Nos. 7, 8, 9 and 9A were all rebuilt in Burma teak, on the original foundations during the summer months. The new houses have been designed to provide the maximum amount of light during the short dull winter months. To provide this additional light, the side lights were raised six inches, the old fashioned roof lantern was done away with, less glazing bars and larger panes of glass were used. The side stages were all renewed, and the hot water pipes were renewed in Houses Nos. 7, 8 and 9. The potting shed was extended up to the Odontoglossum pit, thus providing more adequate room for working, and storing materials.

A new porch was constructed at the gable end of No. 7 and from this porch a corridor links up the South African, and Sherman Hoyt Houses. This is a great improvement and should assist the public to move from house to house with ease, and prevent congestion during the summer months when crowds of public visit these houses.

After the rebuilding operations the two large permanent beds in No. 9 Nepenthes house were resoiled, many of the large overgrown plants and climbers when taken out of these beds in early summer were repropagated, and replaced by smaller specimens so as to provide more room. The small beds under the side stages in houses Nos. 7, 8, and 9 were all resoiled and planted with young climbers.

Tropical Pits

During the year several consignments of seeds were received through the Herbarium ; one of the consignments was collected by Messrs. R. B. Drummond and J. H. Hemsley.

The majority of these seeds germinated freely, and a good number of plants have been successfully raised, some of the species providing valuable additions to the living collections, as well as providing material for Herbarium specimens. We continued to propagate material from many of the large specimen plants in the Palm House, of which our stocks were limited. It is interesting to note that we were successful in rooting, and establishing a small piece of Dendrocalamus giganteus. This small head of young growths formed on one of the long shoots, which had to be partly cut back to prevent it going through the glass the previous year. When the young shoots were approximately twelve inches long, the complete head was taken off, potted up, and placed in a close frame where it rooted freely. The following economic plants were propagated in the early part of the year : several species of "Groundnuts" (*Arachis*) and *Cephaelis Ipecacuanha*, both of which we had requests for from overseas.

During the year the following plants were shown at the Royal Horticultural Society's Shows in London and all received Awards of Merit : *Ixora chinensis*, *Burchellia capensis* and *Angelonia gardneri*.

Plant material despatched

2 Wardian cases of plants to the Director, Botanic Gardens, British Guiana.

1 Wardian case of plants to the Director, Royal Botanic Gardens, Peradeniya, Ceylon.

Rooted cuttings of Cephaelis Ipecacuanha to the Department of Agriculture, Ibadan, Nigeria, and Director of Agriculture, British Honduras.

18 Arachis species to Inst. de Recherches pour les Huiles et Oleagineux, Paris.

During the season several collections of plants have again been received including the following :—collection of Tropical Nymphaea tubers from G. H. Pring, Missouri Botanic Garden, South African Succulent plants chiefly Haworthias from E. Shurley. Succulent plants including Aloes, Euphorbias, Adeniums, etc. from Mr. P. R. Bally, Nairobi. Succulent plants from S. Africa including Haworthias, *Conophytum* and *Euphorbia* spp. collected by H. Hall, Kirstenbosch Botanic Garden. A large collection of Kalanchoe species from J. Marnier-Lapostolle, Les Cedres, Cap Ferrat, France.

A new experimental house has been erected, on the Chrysanthemum plunging ground in the Melon Yard. The house is constructed of light aluminium alloy with large panes of glass ; it is nearing completion and should be ready for the use of the department early in the New Year.

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Plant Quarantine versus the Pests.*—The author, retiring after 30 years' service as Plant Pathologist in American plant quarantine, has written a book to show what plant quarantine is, why it exists, and what it is accomplishing. To many of us it is little more than a reported skirmish with Colorado beetle invading Kent, or an onslaught elsewhere on nurseries harbouring strawberry virus. To the author, plant quarantine is a campaign, indeed a crusade, to be waged on a grand scale, on many fronts, and without forseeable end, whose conduct affects more or less directly the wellbeing of everyone in the country to which it applies.

The author's view is the realistic one and he justifies it in his discussion of quarantine in five main aspects. The first, and perhaps the most absorbing, is the biological background, the fruitful fields, orchards and forests of North America and the ravages caused there by diseases and pests of which well over half have come from other lands, introduced too often by the carelessness or irresponsibility of man. But still more and worse scourges remain without, and, as Mr. McCubbin writes, we can almost see them champing and licking their lips as they try to find a way through the man-made barrier of plant quarantine set up to check their inroads. In subsequent chapters the author describes the forms that quarantine may take, its impact on trade and the life of the community, the legal aspect and administration, and finally its probable development in the changing world of speedier transport.

No other writer, as the author points out, " has yet undertaken to present the subject as a composite whole ", and this is the merit of the book that it deals so competently with the subject in all its aspects and presents a complete picture of how the United States is meeting the assault of foreign pests, a problem facing every other country. The appeal of this book in this country is likely to be restricted to those directly concerned in plant protection, but few reading it can fail to be inspired by the conflict and to gain a clearer impression of the issues at stake.

A point stressed by the author, and one which the reviewer can endorse from his own experience, is the necessity of having the understanding support of the community if quarantine measures are to be really successful, and for this purpose it is important that the public be kept well informed of the position and the aims of plant quarantine. There seems room indeed for a similar book to Mr. McCubbin's, perhaps not so solid and comprehensive a work, perhaps a little more popular in style (and, may we hope, in price) which will review the position in Britain and tell us how the battle goes round these coasts.

T. A. Russell.

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* The Plant Quarantine Problem : a General Review of the Biological, Legal, Administrative, and Public Relations of Plant Quarantines with Special Reference to the United States Situation : by W. A. McCubbin, M.A., Copenhagen : Ejnar Munksgaard, 1954, pp. 255, Price 33/9d.

NOTES ON AFRICAN STRYCHNOS: I

E. A. Bruce

Strychnos § **Spinosae** *Duvign.*

In connection with work on the section *Spinosae* Duvign. of the genus *Strychnos* for the Flora of Tropical East Africa, I have come to the conclusion, after examining a large amount of material and a great many type-specimens from different parts of Africa, that a number of species should be reduced, either to synonymy or to the rank of subspecies. Professor P. Duvigneaud[1] has done a great deal of work on the genus and has already reduced a number of species, but I do not altogether agree with his treatment.

The results of my analysis of the material in this section of *Strychnos*, which is detailed below, has convinced me that the best arrangement can be shown as follows :—

1. **S. congolana** *Gilg.* (including 3 later entities).
2. **S. cocculoides** *Bak.* (including 8 later entities).
3. **S. spinosa** *Lam.*
   - a. **subsp. spinosa** (including 5 later entities).
   - b. **subsp. volkensii** (including 5 later entities).
   - c. **subsp. lokua** (including 17 later entities).

The considerations supporting this view in general now follow ; further detailed reasons applying to particular entities will be found under the appropriate species.

The scandent or more or less sarmentose, sparsely spiny members of the section found in the humid forest areas have been represented by four species :—

S. congolana Gilg., *S. viridiflora* De Wild., *S. lecomtei* A Chev. and *S. djalonis* A. Chev. I have examined these four types and also material from Senegambia, Sierra Leone, Ivory Coast, Belgian Congo and Uganda.

S. congolana is described as a sarmentose shrub with tendrils, although I have examined a duplicate of the type-specimen which shows no tendrils. Likewise, *S. viridiflora*, although described as a climber having bifuncate tendrils does not show these on the type-specimen I examined. *S. lecomtei* was originally described by Hutchinson and Dalziel as a scandent shrub and no mention was made of tendrils ; in a later emended description A. Chevalier drew attention to the fact that it was a climber with tendrils. Again, *S. djalonis* is described as a tree with spines. I have examined four different gatherings from the same tree at Newton, Sierra Leone, one of which (*Deighton* 2992) is a good match of the type-specimen of *S. djalonis*, two sheets show spines and on the other two the spines are absent. The tree is described as having pendulous branches and the sarmentose habit is definitely visible on the specimens, one of which (*Deighton* 2205) compares very well with the iso-type specimen of *S. congolana*. The above observations show that the habit is very variable and cannot be used as a differential character. I feel that this difference

[1] Lejeunia **13** : 103 (1949) ; Bull. Soc. Roy. Bot. Belg. **85** : 19 (1952).

may be partially due to environment and that if the individual is isolated the sarmentose tendency is reduced.

It is unfortunate that material of this subsection is rather scanty so that it is not possible to obtain a very clear picture of the variation in relation to geographical distribution. The West African material on the whole, with the exception of that from the Ivory Coast, has rather longer and narrower calyx lobes and a more cuneate leaf base than that from Uganda and the Belgian Congo. The Uganda specimen is particularly robust and that from the Ivory Coast rather poor. There appears, however, to be no correlation in these minor differences and I feel that it is best to treat the material as one variable species and so I have reduced *S. viridiflora*, *S. lecomtei* and *S. djalonis* to synonymy.

The arborescent members of the section inhabiting the dry savannah areas, are, for the most part spiny and have been represented by over 30 species. The majority of these species have been described by the German workers, E. Gilg and W. Busse[2], who had access to a large amount of material, particularly from Tanganyika. It is a great pity that they confined themselves to describing endless new species, very often on sterile and inadequate material, and made no attempt to draw up an analytical key.

J. G. Baker[3] attempted a classification of the genus in the Flora of Tropical Africa using leaf-shape, presence or absence of spines and fruit size as his main separating characters. He did not realize that leaf-size and shape are very variable and depend on circumstances :—whether the tree is in the flowering or fruiting stage, whether burning or grazing has taken place, whether the season has been wet or dry and whether the specimen was collected from a young shoot or older branch. The capacity for forming spines, as Busse remarked, is by no means always developed ; foliage shoots of vigorous individuals rarely form spines, whereas on weakly developed shoots with small leaves, the spines are conspicuous ; branches both with and without spines can be found on the same individual. The fruit size also depends to a large extent on its maturity, so that both this and the above characters must be treated with great reserve and Baker in using them had nearly related species widely separated in his key.

The fruit characters have been discussed in some detail by Gilg and Busse, who probably had fresh material at their disposal. They draw attention to the smooth or warty shell, which may be either bone-hard or loose textured, the number and position of the seeds and the umbonate or truncate fruit-base. I have examined about 25 fruits of dried material and in all cases the shell has been bone hard, and with possibly two exceptions, neither completely smooth nor conspicuously warty ; the seeds have always been numerous, flat, disc-like and densely overlapping, forming a more or less solid central ball and the umbonate base has been observed in two specimens from Tanganyika, one from the Gold Coast and one from Uganda, the former specimens being distinct from the two latter. Thus, I have not found any good diagnostic features in the dried fruits though it is possible that good characters may be present in fresh material.

[2] Engl. Jahrb. 17 : 561 (1893) ; 28 : 118 (1899) ; 32 : 173 (1902) ; 36 : 87 (1905).
[3] Fl. Trop. Afr. 4 (1) : 517 (1903).

The whole of this section is so variable in leaf-shape and -size and so constant in floral structure that it is almost impossible to find absolute characters of diagnostic value. I feel, like Duvigneaud, that subsidiary characters such as texture of bark and leaf, shape of spines and length of calyx-lobes, when considered together and in relation to the geographical distribution of the section are of more value in distinguishing the species and subspecies (Maps 1–3).

Unfortunately a number of type-specimens were destroyed at Berlin during the war, and as the descriptions are often incomplete it is difficult to place the species in their appropriate places with certainty. I have, however, been able to examine a number of Busse's duplicates kindly loaned by the East African Herbarium in addition to types from the British Museum (Natural History), Brussels, Coimbra, Hamburg and Paris. After studying these in addition to the wealth of herbarium material at Kew, the British Museum and that loaned by the East African Herbarium, I have come to the conclusion that it is better to take a wide view of the species and consider that only 2 species, one of which includes 3 subspecies, are involved for the large number of names which have been applied to the arborescent species of the section *Spinosae*.

§ SPINOSAE

Shrubs, small trees or more rarely climbers with forked tendrils, usually armed with paired spines. Inflorescence terminal. Flowers 5-merous. Calyx-lobes narrowly triangular to linear. Corolla campanulate; lobes deltoid, about half the length of the tube, densely bearded at the base. Stamens inserted near the base of the tube; anthers bearded, ± equal to the filaments, included. Ovary subglobose, usually 1-locular; style short or absent. Fruit large globose with a hard shell and numerous ± disc-like seeds.

Key to Species and Subspecies

Scandent shrubs or climbers, more rarely trees with pendulous branches, sparsely spiny and sometimes bearing forked tendrils; leaves membraneous, longer than broad, rounded and then abruptly acuminate at the apex . . . . . **1. congolana**

Erect shrubs or small trees, usually spiny but never bearing tendrils; leaves very variable in shape but apex not as above:

Branches and branchlets longitudinally corky ridged; young branchlets usually reddish or blackish purple, densely pubescent and longitudinally fissured; calyx-lobes not longer than the mature corolla, pubescent on the back; ovary bilocular **2. cocculoides**

Branches and branchlets not as above; calyx-lobes usually glabrous except at the base; ovary unilocular:

Young branchlets with a ± varnished surface, usually dark or mottled:

Calyx-lobes longer than the corolla; inflorescence fairly dense; spines slender ± straight; leaves glabrous except for angle hairs . . . . . **3a. spinosa subsp. spinosa**

Calyx-lobes much shorter than the corolla ; inflorescence rather lax ; spines straight or curved ; leaves glabrous or more rarely pubescent . . **3b. spinosa subsp. volkensii**

Young branchlets neither varnished nor mottled, usually pale and powdery corky ; spines ± stout curved at the apex ; leaves glabrous or more rarely pubescent ; calyx-lobes intermediate between the above . . . **3c. spinosa subsp. lokua**

1. Strychnos congolana *Gilg* in Engl. Bot. Jahrb. **28** : 120 (1899) ; Fl. Trop. Afr. **4** (**1**) : 521 (1903).

S. viridiflora De Wild in Pl. Beq. **2** : 101 (1923).

S. lecomtei A. Chev. ex Hutch. & Dalz. in Kew Bull. **1937** : 333 (1937) ; A. Chev. in Rev. Bot. Appl. **27** : 368, t. 17B (1947).

S. djalonis A. Chev. in Rev. Bot. Appl. **27** : 358, t. 16B (1947).

French Guinea. No locality, *Heudelot* 813 ! Between Kaba and Haut Mamou, May 1905, *Chevalier* 12716 ! 12766 ! ; Fouta Djalon, Ditinn, *Chevalier* 12179 bis (holotype of *S. djalonis* in P !).

Sierra Leone. Newton, *Deighton* 2205 ! 2491 ! 2992 !

Ivory Coast. Bingerville, Abidjan, Dabou, *Chevalier* 15402 (syntype of *S. lecomtei* in P !).

Belgian Congo. Near Kasongo, *Dewèure* 931 (isotype of *S. congolana* in BR !) ; Irumu, 6 Mar. 1914, *Bequaert* 2807 (holotype of *S. viridiflora* in BR !) ; Yangambi, 16 Feb. 1939, *Louis* 13702 !

Uganda. Mengo District : Entebbe Road forests, Nov. 1931, *Laboratory Staff* S. 2369 ! (see Map 2).

2. S. cocculoides *Bak.* in Kew Bull. **1895** : 98 (1895) ; Fl. Trop. Afr. **4** (**1**) : 533 (1903) ; Engl., Bot. Jahrb. 36 : 110 (1905) ; Lejeunia **13** : 114 (1949) ; Bull. Soc. Roy. Bot. Belg. **85** : 20, fig. 6A (1952).

? *S. dekindtiana* Gilg in Notizbl. Bot. Gart. Berl. **2** : 258 (1899) ; Fl. Trop. Afr. **4** (**1**) : 534 (1903).

S. goetzei Gilg in Engl., Bot. Jahrb. **28** : 123 (1899) ; Fl. Trop. Afr. l.c. ; Tanganyika Check List **2** : 277 (1949).

S. schumanniana Gilg in Baum, Kuene-Samb. Exped. 330 (1903) ; Fl. Trop. Afr. l.c. 624 ; Tanganyika Check List l.c. 275.

S. suberosa De Wild., Étude Fl. Bas et Moyen Congo **1** : 77 (1904) ; Fl. Trop. Afr. l.c. 624.

S. suberifera Gilg & Busse in Engl., Bot. Jahrb. **36** : 107 (1905) ; Tanganyika Check List l.c. 275.

S. thomsiana Gilg & Busse in Engl., Bot. Jahrb. **36** : 111 (1905).

S. thomsiana var. *elegans* Gilg & Busse l.c.

? *S. paralleloneura* Gilg & Busse l.c. 112.

Belgian Congo. Kisantu, *Louis* 60 ! ; Lemfu, *Gillet* 2261 (holotype of *S. suberosa* in BR !).

Tanganyika. Lindi District : Mayanga, 15 May 1903, *Busse* 2524, 2524a (iso-syntype of *S. suberifera* in EAH !) ; East Ungoni, Dec. 1900, *Busse* 735 ! (cited by Busse under *S. goetzei* in Engl., Bot. Jahrb. **32** : 179 (1902)).

Nyasaland. Kasungu, 26 Aug. 1946, *Brass* 17433 !

Southern Rhodesia. Marandellas, 20 Oct. 1945, *J. M. Rattray* 753 ! ; Salisbury, Oct. 1922, *Eyles* 3694 !

Northern Rhodesia. Abercorn to Mpulungu road, 30 Sept. 1949, *Bullock* 1117 ! ; Fort Roseberry, 1 Sept. 1952, *F. White* 3186 !

Angola. Huilla, *Welwitsch* 4779 (holotype of *S. cocculoides* in K ! and BM !) ; Kubango River below Massaca, 19 Nov. 1899, *Baum* 290 (isotype of *S. schumanniana* in K !) ; Loanda, *Welwitsch* 4763 ! (cited by Gilg & Busse as probably *S. thomsiana* in Engl., Bot. Jahrb. **36** : 112 (1905)) ; *Welwitsch* 6019 ! (cited as *S. thomsiana* var. *elegans* in Engl., Bot. Jahrb. l.c.

Transvaal. Magalisberg, 4 Nov. 1893, *Schlechter* 3630 ! ; Waterberg, 10 miles NW. of Nylstroom, 26 Sept. 1950, *Codd* 6151 ! (see Map 1).

Map. 1. Distribution of *S. cocculoides* Bak.

Note. Specimens cited by the author of the species as probably belonging to that species, have been examined in all cases except in *S. dekindtiana* and *S. paralleloneura*. In these two cases the author has stated that the species are nearly related to *S. cocculoides*. I find nothing in their descriptions to keep them out of this species so have tentatively placed them here.

It is interesting to note that Mr. F. White, has stated on the label of his No. 2344 :—" Semi-lianoid 6 m. high . . . (erect trees of same species seen nearby) ". This statement seems to bear out my supposition that habit is partially due to environment and too much stress must not be laid on it.

Variation. There is a certain amount of variation in pubescence within this species. The majority of specimens have densely pubescent branchlets and leaves but there are some specimens from Angola (*Welwitsch* 4763, 6019) in which the branchlets and leaves are glabrous. As specimens also occur which are only slightly pubescent on the nerves below, I feel that this character is not sufficiently clear cut for varietal separation.

3. S. spinosa *Lam.*, Ill. **2** : 38 (1797) ; Spreng., Sys. **1** : 672 (1825) ; Fl. Trop. Afr. **4** (**1**) : 536 (1903) excl. Welwitsch's specimens from Loanda ; Fl. West Trop. Afr. **2** : 22 (1931) excl. syn. *S. djalonis* A. Chev. & Chevalier specimens ; Rev. Bot. Appl. **27** : 355 (1947) ; Tanganyika Check List **2** : 277 (1949) ; Lejeunia **13** : 109 (1949).

3a. subsp. spinosa

Young branchlets with a ± varnished surface, usually dark or mottled ; branchlets not powdery-corky ; spines slender, ± straight ; leaves glabrous except for angle hairs, ± membranous with inconspicuous tertiary venation ; inflorescence fairly dense ; calyx lobes longer than the corolla.

Cucurbitifera arbor spinosa . . . . . Pluk. Phytogr. t. 170, f. 4 (1691).

Vontaca Flacourt., Hist. Madag. ed. 2, p. 121, n. 13 (1661).

Caniram vontac Du Petit Thouars in Dict. Sci. Nat. **6** : 428 (1817).

Caniram de Madagascar Du Petit Thouars l.c. 427 (1817).

Brehmia spinosa Harv. in DC., Prod. **9** : 18 (1845).

Strychnos madagascariensis Poir., Encycl. **8** : 696 (1808) ; Spreng., Syst. Veg. **1** : 672 (1825).

S. vuntac Boj., Hort. Maurit. 205 (1837) ***nomen illegit.***

S. carvalhoi Gilg in Engl., Bot. Jahrb. 28 : 123 (1899) ; Fl. Trop. Afr. **4** (**1**) : 535 (1903).

Tanganyika. Mafia Island, Baleni, 2 Sept. 1937, *Greenway* 5213 ! ; near Dar es Salaam, *W. D. Raymond* 23 !

Portuguese East Africa. Between Mussoril and Cabeceira, 1884–85, *Carvalho* s.n. (holotype of *S. carvalhoi* in COI !) ; Massinga, Sept. 1936, *Gomes e Sousa* 1850 !

Madagascar. In woods on the shore, in Herb. Hook as *S. madagascariensis* Spreng. Sys. ! ; *Blackburn* s.n.

Seychelles. Mahé, Sept. 1871, *J. Horne* 329 !

Transvaal. Crocodile Poort near Barberton, Sept. 1890, *Galpin* 1075 ! ; Mahende Mission Station, NE. of Sibasa, 18 Feb. 1952, *Codd* 6813 !

Swaziland. Banks of Mzimpofu River, 11 Dec. 1931, *Pole Evans* 3420 (29) !

Natal. Durban, *Krauss* 99 ! (incorrectly selected by Harvey as the type of his genus *Brehmia*) ; Inanda, Nov., *Wood* 1084 !

Eastern Cape. Pondoland : between Umtentu and Umzimkulu Rivers, *Drege* s.n. !; Albany, *Bowker* s.n. ! (see Map 2).

Note. *S. madagascariensis* is described as 4-merous with a large 1-seeded fruit, but I feel this is an aberrant form of *S. spinosa.*

3b. subsp. volkensii (*Gilg*) *E. A. Bruce* comb. et stat nov.

Similar to subsp. *spinosa* but leaves slightly larger, glabrous or pubescent on the nerves below ; spines, when present straight or curved. Inflorescence fairly lax. Calyx-lobes much shorter than the corolla.

S. volkensii Gilg in Engl., Pfl. Ost-Afr. **C** : 311 (1895) ; Fl. Trop. Afr. **4** (**1**) : 536 (1903) ; Trees & Shrubs of Kenya Colony 124 (1936) ; Tanganyika Check List **2** : 278 (1949) ; Lejeunia **13** : 111 (1949).

[*S. spinosa* (non Lam.). — Battiscombe, Trees & Shrubs of Kenya Colony 124 (1936)].

? *S. sansibarensis* Gilg in Engl., Bot. Jahrb. **28** : 124 (1899) ; Fl. Trop. Afr. l.c. 535 ; Tanganyika Check List l.c. 277.

? *S. megalocarpa* Gilg & Busse in Engl. Bot. Jahrb. **32** : 180 (1902) ; Fl. Trop. Afr. l.c. 526 ; Tanganyika Check List l.c. 278.

? *S. omphalocarpa* Gilg & Busse in Engl. Bot. Jahrb. l.c. 181 (1902) ; Fl. Trop. Afr. l.c. 525 ; Tanganyika Check List l.c.

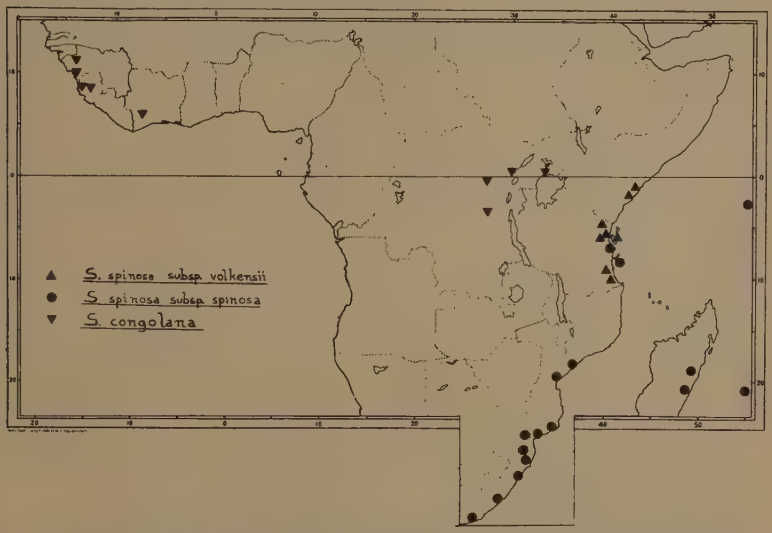
? *S. radiosperma* Gilg & Busse in Engl., Bot. Jahrb. **36** : 108 and t. 2c (1905) ; Tanganyika Check List l.c. 275.

? *S. cuneifolia* Gilg & Busse in Engl., Bot. Jahrb. l.c. 109 ; Tanganyika Check List l.c. 273.

KENYA. Lamu District : Witu, *Thomas* 198 ! ; Kwale, *Graham* 1770 !

TANGANYIKA. Tanga, Jan. 1893, *Holst* 2095 (iso-syntype of *S. volkensii* in K !) ; East Usambaras : Mtindiro, 4 Sept. 1940, *Greenway in A.H.* 8661 ! ; Kilwa District : Matumbiberge, Mirungamo, *Busse* 3061 (isotype of *S. radiosperma* in EAH !) ; Lindi District : Lake Lutamba, 15 May 1903, *Busse* 2519 (isotype of *S. cuneifolia* in EAH !).

ZANZIBAR. Marabubi, 25 Sept. 1930, *Vaughan* 1574 ! ; *Stuhlmann* 1011 (iso-syntype of *S. sansibarensis* in HBG !). (See Map 2).



MAP. 2. Distribution of *S. congolana* Gilg, *S. spinosa* Lam. subsp. *spinosa* and *S. spinosa* subsp. *volkensii*.

NOTE. 1. *S. sansibarensis* has tentatively been included here mainly on the grounds that two other specimens from Zanzibar definitely belong. Stuhlmann 1011 consists of a small twig devoid of lateral spines and a few leaves, it might almost equally well be placed under subsp. *spinosa*.

2. *S. megalocarpa* and *S. omphalocarpa* have been tentatively placed here as the fruits in both cases are described as having a warty shell and the locality is the same as for *Burtt* 4841 which belongs here.

3. The isotype-specimens of both *S. cuneifolia* and *S. radiosperma* have been examined, these consist of twigs bearing old leaves, whereas the isotype of *S. volkensii* is of young leaves and flowers, so true comparison is really impossible. The ultimate twigs of both species, however, are ± varnished and definitely not powdery corky, so they do not belong to

subsp. *lokua*. The fruits of both are described as having a warty shell, which is also true for two specimens of subsp. *volkensii*, so the weight of evidence places them here rather than under subsp. *spinosa*. It is very difficult to distinguish these two subspecies unless flowers are present. It is true that the leaves are larger and rather different in shape from typical *S. volkensii* but leaf shape and size within this group are so variable that I do not feel at the present inadequate state of our knowledge any good purpose is served by making a new variety. It would be most helpful if collectors would mark trees and collect fruiting material and old leaves which correlate with the young leaves and flowers, in this way our knowledge of the group would be increased.

3c. subsp. lokua (*A. Rich.*) *E. A. Bruce* comb. et stat nov.

Differs from subsp. *spinosa* and *volkensii* in having pale, matt, unvarnished young branchlets and powdery-corky old branchlets ; spines, when present, fairly stout and usually curved at the apex. Leaves more coriaceous with more conspicuous tertiary nerves below. Calyx-lobes intermediate in length between subsp. *spinosa* and subsp. *volkensii*.

[*S. spinosa* (non Lam.). — Dale, Indigenous Trees of Uganda, ed. 2 : 169 (1951)].

S. lokua A. Rich., Tent. Fl. Abyss. **2**: 53 (1851); Lejeunia **13**: 112 (1949).

S. buettneri Gilg in Engl., Bot. Jahrb. **17** : 574 (1893) ; Fl. Trop. Afr. **4** (**1**) : 535 (1903).

S. gracillima Gilg in Engl., Bot. Jahrb. **17** : 573 (1893) ; Fl. Trop. Afr. **4** (**1**) : 536.

S. laxa Solered. in Engl., Bot. Jahrb. **17** : 554 (1893).

S. schweinfurthii Gilg in Engl., Bot. Jahrb. **17** : 568 (1893) ; Fl. Trop. Afr. l.c. 525.

? *S. tonga* Gilg in Engl., Bot. Jahrb. **17** : 575 (1893) ; Fl. Trop. Afr. l.c. 527 ; Tanganyika Check List **2** : 275 (1949).

? *S. miniungansamba* Gilg in Notizbl. Bot. Gart. Berl. **1** : 77 (1898) ; Fl. Trop. Afr. l.c. 536.

? *S. euryphylla* Gilg & Busse in Engl., Bot. Jahrb. **32** : 179 (1902) and **36** : 108 and t. 2A (1905) ; Fl. Trop. Afr. l.c. 526 ; Tanganyika Check List l.c. 274.

S. emarginata Bak. in Fl. Trop. Afr. **4** (**1**) : 537 (1903).

S. spinosa Lam. var. *pubescens* Bak. in Fl. Trop. Afr. **4**(**1**) : 537 (1903).

S. gilletii De Wild., Études Fl. Bas et Moyen Congo **1** : 76 (1904).

S. cardiophylla Gilg & Busse in Engl., Bot. Jahrb. **36** : 110 (1905) ; Tanganyika Check List l.c. 273.

S. harmsii Gilg & Busse in Engl., Bot. Jahrb. **36** : 109 (1905) ; Tanganyika Check List l.c. 274.

? *S. leiosepala* Gilg & Busse in Engl., Bot. Jahrb. **36** : 111 (1905).

S. rhombifolia Gilg & Busse in Engl., Bot. Jahrb. **36** : 107 (1905).

S. dulcis A. Chev., Études Fl. Afr. Centr. Franç. 203 (1913), *nomen nudum*.

S. courteti A. Chev., l.c. (1913).

S. pluvialis A. Chev., l.c. 204 (1913).

GAMBIA. Between Georgetown and Kuntaur, 10 Jan. 1927, *Dalziel* 8072 !

FRENCH GUINEA. Farana, banks of Niger River, 26 Mar. 1892, *Scott Elliot* 5384 ! ; near Moira, on Scarcies, 13 Feb. 1892, *Scott Elliot* 4801z!

GOLD COAST. Between Pan and Bujan, 18 April 1927, *Kitson* 908 ! ; Ejura, 29 Aug. 1921, *Chipp* 764 !

TOGOLAND. Without locality, *Kersting* 102 ! (Duplicate from Berlin from same Province as type of *S. buettneri*. Gilg states after his description of this species that *Scott Elliot* 5384 probably belongs here).

NIGERIA. Agaie, 20 May 1919, *Yates* 54! Nupe, *Barter* 1140 (holotype of *S. laxa* in K! ; Western Lagos, Ada Ischu, *Rowland* 5 !

CAMEROONS. Mbussa, April 1914, *Mildbraed* 9134 ! (Mildbraed has named this *S. rhombifolia* Gilg & Busse and has later added that he does not think it is specifically different from either *S. buettneri* or *S. laxa*).

MAP 3. Distribution of *S. spinosa* Lam. subsp. *lokua*.

BELGIAN CONGO. Kisantu, *Gillet* 134 (holotype of *S. gilletii* in BR !).

PORTUGUESE CONGO. Nkanda hills, 18 Oct. 1921, *M. T. Dawe* 86 !

UBANGI-CHARI. Ndellé, 20 Dec. 1902, *Chevalier* 7543 ! 6994 ! (cited by Chevalier as *S. dulcis*) ; *Chevalier* 7545 ! (cited as *S. courteti*).

A.–E. SUDAN. Djurland : between Dimo and Axem, 28 April 1869, *Schweinfurth* 1573 ! ; Didinga Mts., near Naligede, 22 Apr. 1939, *Myers* 11009 ! Seriba Ghattas, 11 Apr. 1869, *Schweinfurth* 1396 (holotype of *S. emarginata* in K !).

ETHIOPIA. Tacazzé valley, *Quartin Dillon & Petit* s.n. (holotype of *S. lokua* in P !).

UGANDA. West Nile District : Mt. Ite, Feb. 1934, *Eggeling* 1509 ! Acholi District : Agoro, Mar. 1935, *Eggeling* 1604 !

KENYA. West Suk District : Kapenguria, *Bally* 4051 ! ; Kitui District : Kitui, 18 Jan. 1942, *Bally* 1706 !

TANGANYIKA. Lindi District : Rondo Plateau, 16 May 1903, *Busse* 2560 ! 2596 ! (iso-syntypes of *S. harmsii* in EAH !) ; near Kilwa, Singinoberg, 1 July 1903, *Busse*, 3011 ! (isotype of *S. cardiophylla* in EAH !) ; Ungoni highlands, Kwa-Lituno, 10 Jan. 1901, *Busse* 1263 ! (iso-syntype of *S. euryphylla* in EAH !)—this is a coppice shoot and might equally well be placed under subsp. *volkensii*) ; Matumbi Mts., near Simburanga, 9 July 1903, *Busse* 3129 ! (cited by Gilg & Busse in Engl., Bot. Jahrb. **36** : 108 under *S. euryphylla*) ; Shinyanga, *Kortischoner* 1718 !

NYASALAND. Shire Highlands, *Buchanan* s.n. ! ; Mount Sochi, Oct. 1859, *Kirk* 129 (cited by Baker in Fl. Trop. Afr. **4** (**1**) : 537 under *S. spinosa* v. *pubescens*).

Portuguese East Africa. Near Goronzoza, 10 Dec. 1908, *Johnson* 284 !

Southern Rhodesia. Salisbury, 3 Nov. 1926, *Eyles* 4540 ! ; near Chirinda, 30 Oct. 1906, *Swynnerton* 55 !

Northern Rhodesia. Barotse Province : Senanga Boma, 9 Feb. 1952, *F. White* 2034 ! ; Mporokosa District : Mweru Wantipa, Oct. 1949, *Bullock* 1207 !

Angola. Golungo Alto, *Welwitsch* 4768 ! (cited by Busse in Engl., Bot. Jahrb. **36** : 111 (1905) as probably belonging to *S. leiosepala*) ; Malange, *Gossweiler* 1118 ! 1126 !

Transvaal. Barberton, Apr. 1890, *Galpin* 895 ! ; Nelspruit District, near Pretorius Kop, 9 Sept. 1948, *Codd* 4412 !

Cape Province. Knysna, *F. A. Rogers* 28431 ! (See Map 3).

Note. The type specimen of *S. gracillima* has not been seen but Gilg & Busse in Engl., Bot. Jahrb. **36** : 93 (1905), state :—" Baker has under this name (*S. emarginata*) once again described the Gilgian original specimen of *S. gracillima*. The above name is thus a synonym ". I have examined the type specimen of *S. emarginata* and although it has emarginate, more coriaceous leaves than the type of *S. lokua* I believe this is partly due to drier conditions and see no reason to separate it from that species and have therefore treated *S. gracillima* in the same way. I have not seen the type of *S. schweinfurthii* but from its description and distribution it should be placed here.

S. tonga Gilg and *S. miniungansamba* are more difficult to place. The former is described as having densely tomentose leaves, which character is present in some forms of subsp. *lokua*, so it has been placed here tentatively, though the locality points rather to subsp. *spinosa*. *S. miniungansamba* was collected in Angola, so from the geography it should belong either here or to *S. cocculoides*. There is no mention of the corky branchlets characteristic of *S. cocculoides*, so the species has been tentatively placed here.

S. euryphylla is again difficult to place. I have seen *Busse* 1263, one of the three Busse specimens cited after the type description. This appears to be a coppice shoot and so is not typical. The colour of the twig suggests rather subsp. *volkensii* than here. Later, however (Engl., Bot. Jahrb. **36** : 108 (1905)) Gilg and Busse cite two further specimens, *Busse* 2899 and 3129. The latter has the characteristic powdery corky bark of subsp. *lokua* but this is not true of *Busse* 2899 which appears to lie between subsp. *lokua* and subsp. *volkensii*. The fruit in the original description of *S. euryphylla* is described as smooth skinned, which rather suggests subsp. *lokua* as I have seen no mention of warty fruits in descriptions of specimens cited under this subspecies, though they are frequently mentioned for those under subsp. *volkensii*. The species has therefore been tentatively placed here as a synonym.

In conclusion, a word about the general treatment of the above species. Not everyone will agree with the wholesale reduction of species to synonymy, though surprisingly enough Chevalier[4] eventually came to this conclusion. I feel that until our knowledge of the groups has been enlarged and enriched by more complete material and intensive field study, it is better to err on the side of reduction than addition.

In separating the species and subspecies emphasis has been primarily laid on texture and colour of branchlets and texture of bark, partially because most of the material dealt with has been sterile ; the length of the calyx-lobes has been used as a secondary character.

[4] Rev. Bot. Appl. **27** : 258 (1947).

NOTES ON THE AFRICAN SPECIES OF THE GENUS ANTHOCLEISTA Afzl. ex R. Br.

E. A. Bruce

The following notes are the outcome of investigations of the genus in connection with work on the Flora of Tropical East Africa. Many of the species of Anthocleista found in East Africa also occur in other parts of the African continent so it was decided to investigate all the large-leaved tree species of the genus.

I must thank the following authorities, who have kindly sent material on loan to me or allowed me to examine their specimens :—Dr. G. Taylor, Department of Botany, British Museum (Natural History), London ; Prof. Dr. W. Robyns, Jardin Botanique de l'Etat, Brussels ; Dr. P. J. Greenway, O.B.E., East African Herbarium, Nairobi ; Prof. Dr. W. Domke, Botanischer Garten, Hamburg ; Prof. T. G. B. Osborn, until recently head of the Department of Botany, The University, Oxford, and Prof. H. Humbert, Muséum National d'Histoire Naturelle, Paris.

The genus *Anthocleista* was first discovered in Sierra Leone by Afzelius who named but did not describe it. Robert Brown[1] published the name in 1818. He differentiated the genus from the American genus *Potalia* Aubl. but did not give a full generic description. The diagnosis is, however, sufficient to validate the name.

These two genera are very closely allied, the main difference being that *Potalia* has a peculiar, large, sterile, globular structure between the style-base and the ovary, and larger seeds with a horny nutritive tissue (see fig. 24 in Engl. & Prantl. Pflanzenfam. **4** (**2**), 43). *Anthocleista* and *Potalia*, together with the extra-African genus *Fagraea* Thunb. form a natural group and have, indeed, been placed by Lindley[2] in a separate family, the *Potaliaceae*.

The first specific epithet to be provided for *Anthocleista*, namely *A. macrophylla*[3] was for a species from Sierra Leone brought into cultivation about 1820, but no description of the species was given. It was not until 1838 that G. Don[4] described the two species, *A. nobilis* and *A. macrophylla*, both from the mountains of Sierra Leone. The specific descriptions are brief and do not give diagnostic characters sufficient to separate the two, neither are any specimens cited, though, presumably Don had access to Afzelius' specimens as well as his own. There is one specimen collected by Donat the British Museum (Natural History) and this is conspecific with the two Afzelius specimens in the same herbarium which are written up:—

Sheet 1 " Anthocleista, Sierra Leone, Mr. Afzelius ".

Sheet 2 " Anthocleista nobilis Don .... see Fl. Nigr. 460 & Bot. Jahrb. 17, 575 "

" Anthocleista nigrescens "

I therefore nominate the species *A. nobilis* G. Don as the type of the generic name and relegate *A. macrophylla* to synonymy. Hooker[5] was

[1] R. Br. in Tuckey, Congo, App. 449 (1818).
[2] Lindl., Nat. Syst. ed. **1**, 209 (1830).
[3] Loud., Hort. Brit. 471 (1830).
[4] G. Don, Gen. Syst. **4**, 68 (1838).
[5] Hook. Niger Flora 460 (1849).

also of the opinion that *A. macrophylla* was merely a cultivated form *A. nobilis*.

KEY[6] TO LARGE-LEAVED TREE SPECIES OF AFRICAN ANTHOCLEISTA

Branches armed with short, usually paired spines ; flower-buds uniformly rounded or subtruncate at the apex (see Fig. 1./1–4) :

Mature corolla-tube not much longer than the calyx and subequal to the corolla-lobes ; leaves sessile or subsessile ; leaf margin never rounded at the base ; blade usually obovate never drying black ; branches conspicuously spiny . . . . . 2. *A. vogelii*

Mature corolla-tube at least twice the length of the calyx, 2–3 times longer than the corolla-lobes ; lower leaves usually petiolate :

Leaf margin always cuneate at the base, blade elongate-oblanceolate, often drying black ; branches conspicuously spiny 1. *A. nobilis*

Leaf margin usually rounded at the base, blade obovate, not drying black ; branches with incipient or occasional spines 3. *A. djalonensis*

Branches unarmed ; or if with incipient or occasional spines then flower-buds not rounded, but pointed or tapering at the apex (see Fig. 1/5–7) :

Leaves petiolate and buds uniformly rounded at the apex :

Leaves obovate usually rounded at the base ; calyx narrowed, not definitely constricted at the mouth ; branches with incipient or occasional spines . . . . . 3. *A. djalonensis*

Leaves elongate-oblanceolate always cuneate at the base ; calyx definitely constricted at the mouth, branches never spiny 4. *A. liebrechtsiana*

Leaves sessile or subsessile, if petiolate then with buds not rounded but pointed or tapering at the apex:

Calyx-lobes drying smooth, clasping the corolla-tube during flowering, only spreading when fruit mature ; leaves, at least the upper ones, usually petiolate, lower ones often sessile or subsessile, usually subcoriaceous with inconspicuous tertiary nerves ; inflorescence comparatively short 5. *A. schweinfurthii*

Calyx-lobes drying rugulose, outer pair at least ± spreading, not closely clasping the corolla-tube during flowering, widely spreading in fruit ; leaves sessile or subsessile, usually membranous with conspicuous tertiary nerves ; inflorescence ± elongate :

Fruits umbonate at the apex, at least when young ; fruiting pedicels usually less than 1 cm. long ; calyx lobes 8–10 mm. long and corolla-tube 7–8 mm. broad in flowering stage (East & South Africa) . . . . . 6. *A. zambesiaca*

[6] This Key has been compiled from herbarium material and should be used with discretion when dealing with plants in the field.

Fruits rounded or truncate at the apex ; fruiting pedicels usually 1·5 cm. long ; calyx-lobes shorter and corolla-tube narrower than above (West Africa) . . 7. *A. procera*

1. A. nobilis *G. Don*, Gen. Syst. **4,** 68 (1838) ; Bak. in Fl. Trop. Afr. **4** (**1**), 538 (1903) partim excl. syn. *A. vogelii* Planch., *A. buchneri* Gilg, *A. niamniamensis* et *A. macrantha* Gilg ; Fl. West Trop. Afr. **2,** 18 (1931) partim excl. syn. *A. djalonensis* A. Chev.

A. macrophylla G. Don l.c.

A. nigrescens Afzl. ex Gilg in Engl., Bot. Jahrb. **17,** 575 (1893) nomen.

A. parviflora Bak. in Kew Bull. **1895,** 99 (1895) ; Bak. l.c. 539.

A. procera Lepr. var. *parviflora* A. Chev. Bot. 441 (1920).

A. procera Lepr. var. *umbellata* A. Chev. l.c.

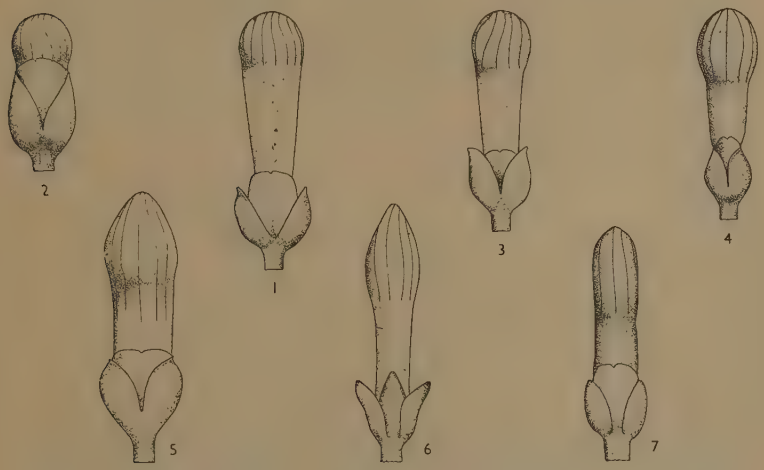


FIG. 1. Buds of different species of *Anthocleista* drawn from dried material, × 2 :— 1, A. nobilis ; 2, A. vogelii ; 3, A. djalonensis ; 4, A. liebrechtsiana ; 5, A. schweinfurthii ; 6, A. zambesiaca ; 7, A. procera.

This species is recognised in the dried state by the short paired spines on the branches, the dark-coloured oblanceolate or elongate-obovate usually petiolate leaves and the long corolla-tube, which is almost three times the length of the lobes and much longer than the calyx. The species is restricted to West Africa (see map, Fig. 2).

FRENCH GUINEA : On the banks of the Konkouré River at Ymbo, *Chevalier* (*O. Caille*) 14759 ! ; Conakry & Los Isl., *Chevalier* 12250 !

SIERRA LEONE : Without locality, *Afzelius* s.n. (BM !) ; *Don* s.n. (lectotype of *A. nobilis* in BM !) ; Bagroo River, *Mann* (holotype of *A. parviflora* in K !) ; Njala, *Deighton* 512 !

LIBERIA : Dukwia River, *Cooper* 190 ! 380 !, 428 ! ; Gbanga, *Linder* 542 !

IVORY COAST : Makougnié, *Chevalier* 16156 bis !

GOLD COAST : 15 miles NW. of Prestea, *Vigne* 1270 !

2. A. vogelii *Planch.* in Hook., Ic. Pl. tt. 793–794 (1848) ; Fl. West Trop. Afr. **2,** 18 (1931).

[*A. nobilis* (non G. Don)—Bak. in Fl. Trop. Afr. **4** (**1**), 538 (1903) *quoad spec. S. Nigeria, Ibu, Vogel* 51].

A. kalbreyeri Bak. in Kew Bull. **1895,** 99 (1895) ; Bak. l.c. 540.

A. zenkeri Gilg in Engl., Bot. Jahrb. **28,** 124 (1899) ; Bak. l.c. 539.

A. auriculata De Wild. in Ann. Mus. Congo, sér. 5, **3,** 250, t. 31 (1910).

A. talbotii Wernh. in Cat. Talbot Nig. Pl. 68 (1913).

A. bequaertii De Wild. in Rev. Zool. Afr. **10,** Suppl. Bot. 8 (1922).

The type specimens of the above species relegated to synonymy have been examined and in my opinion are not separable from *A. vogelii*. Hutchinson, in the Flora of West Tropical Africa, was also of the opinion that *A. kalbreyeri*, *A. zenkeri* and *A. talbotii* were synonymous with *A. vogelii*.

Fig. 2. Map showing distribution of A. vogelii, A. nobilis & A. macrantha.

With regard to the other two species, *A. bequaertii* has the characteristic short corolla-tube subequal lobes and short rounded buds of *A. vogelii*, whilst *A. auriculata*, though having a rather longer corolla-tube than typical specimens of *A. vogelii* is similar in other respects and in my opinion cannot be considered distinct.

There has been a good deal of confusion between the two species *A. vogelii* and *A. nobilis* in the past. They are related in habit and in the paired spines on the branchlets but differ in that *A. vogelii* has broader, obovate, sessile or subsessile leaves, and a shorter corolla-tube, which is usually scarcely longer than the calyx and subequal to or slightly longer than the corolla-lobes. *St. Clair-Thompson* 1815 from Uganda, Ankole District, Ruampara differs from the typical species in having rather shorter corolla-lobes, which are about $\frac{3}{4}$ the length of the tube, less conspicuous spines and more membranous leaves. *A. vogelii* has a much wider distribution than *A. nobilis* (see map, Fig. 2).

Sierra Leone : Near Kolia, *Deighton* 3204 !

Liberia : Gbanga, *Linder* 533 !

Gold Coast : Kwaben, *Vigne* 1295 !

Southern Nigeria : Ibu, *T. Vogel* 51 (holotype of *A. vogellii* in K !) ; Oban, *Talbot* 2027 (syntype of *A. talbotii* in K ! ; BM !) ; banks of River Nun, *Mann* 471 ! ; banks of River Bonny, *Kalbreyer* 61 (holotype of *A. kalbreyeri* in BM !).

British Cameroons : Victoria, *Maitland* 362 !

French Cameroons : Bipinde, *Zenker* 1965 ! (isotype of *A. zenkeri* in K ! ; BM ! ; HBG !) ; Kongola, Mbussa, *Mildbraed* 9107 !

Belgian Congo : Eala, *Pynaert* s.n. ! (holotype of *A. auriculata* in BR !) ; *Corbisier* 1235 ! ; Irumu, *Bequaert* 4904 (holotype of *A. bequaertii* in BR !).

Anglo-Egyptian Sudan : Yambio District ; on bank of River Nabagoon, *Andrews* A1568 !

Uganda : Ankole District : Ruampara, Rwoho, *St. Clair-Thompson* 1815 ! ; West Nile District : Logiri, *Eggeling* 1858 (F.D. 1660) ! ; Masaka District : Buddu, *Fyffe* 14 !

Kenya : North Kavirondo District : Kakamega, *Feltham in E.A.H.* 10290 !

Tanganyika : Bukoba District : 12 miles west of Bukoba, *Eggeling* 6251 ! ; Nyakato, *Gillman* 265 !

Northern Rhodesia : Mwinilunga District : near the headwaters of the Lunga River, *Angus* 574 ! ; by River Matonchi, *Milne-Redhead* 2846 !

Angola : Zaire District : Sumba, Peco, *Gossweiler* 8680 !

Note : *A. macrantha* Gilg in Engl. Jahrb. **17,** 578 (1893) and *A. buchneri* Gilg l.c. 576 are most probably synonymous and may be abnormal forms of *A. vogelii*. The type specimens of *A. macrantha* (*Welwitsch* 6021, 6022) have been examined but unfortunately the type of *A. buchneri* (*Buchner* 618) was destroyed during the war. *A. macrantha* differs from *A. vogelii* in having shortly petiolate leaves, larger flowers with broader corolla-tubes and branches which are either unarmed or possess only incipient spines. Material of typical *vogelii* has been recorded from Zaire District, Angola and I feel that until further material from Angola has been examined the positions of *A. buchneri* and *A. macrantha* cannot be determined with certainty, though in the light of variation within other species I believe that they are not more than aberrant forms of *A. vogelii*.

3. A. djalonensis *A. Chev.* in Bull. Soc. Bot. Fr. **54,** Mém. **8,** 47 (1908).

A. kerstingii Gilg ex Volkens in Notizbl. Bot. Gart. Berl., App. **22,** 33 (1909) ; Fl. West Trop. Afr. l.c.

[*A. nobilis* (non G. Don) Hutch. in Fl. West Trop. Afrl l.c. *quoad syn. A. djalonensis* A. Chev.].

[*A. procera* (non Lepr. ex Bureau) A. Chev. & var. in Chev. Bot. 441 (1920)].

This species has sparingly spiny branches, a rather spreading inflorescence with slender peduncles and comparatively long pedicels (0·5–1·5 cm.). The calyx is small (7–8 mm.); the corolla club-shaped in bud

and rounded at the apex, the tubeis funnel-shaped and about $2\frac{1}{2}$ times the length of the lobes, which are generally about 10 in number ; the infructescence is dropping. The main feature of the species is the leaf-shape, which is very variable. The upper pair of leaves subtending the inflorescence is generally cuneate at the base and though normally petiolate may be subsessile. The leaves remote from the inflorescences are usually conspicuously rounded at the base and fairly long petiolate. This latter character together with the dull matt leaf surface is quite a good diagnostic character. The type specimen of *A. kerstingii* has only the upper pair of inflorescence leaves, which are cuneate at the base and looks very different from *A. djalonensis* in which the leaves are of the typical rounded form. There are, however, many connecting links in the material and I have little hesitation in placing *A. kerstingii* as a synonym of *A. djalonensis*. One specimen (*Kennedy* in F.H.I. 7275 from N. Nigeria, Bauchi Plateau) appears intermediate between this species

Fig. 3. Map showing distribution of A. djalonensis & A. schweinfurthii & possible hybrids.

and *A. liebrechtsiana*, having the obovate leaves of the former and the spineless branches and cuneate leaf-base of the latter. These two species overlap in their distribution and the possibility of hybridization cannot be overlooked (see map Fig. 3).

French Guinea : Kollangui, *Chevalier* 12221, 12222 (syntypes of *A. djalonensis* in P !) ; at Kindia, *Chevalier* 13390 !

Sierra Leone : Musaia, *Deighton* 4827 !

Gold Coast : Mpraeso, *Beveridge* 3288 ! ; Ejura, *Vigne* 2029 ! ; near Agogo, *Vigne* 1125 !

Togoland : Sokode, *Kersting* 18a (isotype of *A. kerstingii* in K !).

Northern Nigeria : Bauchi, Tangale Waje, *Kennedy in F.H.I.* 7275 ! (a possible hybrid).

Southern Nigeria : near Ibadan, *Meikle* 1309 ! ; *J. L. Ladipo* 3006 ! ; Udi, *Chesters* s.n. !

4. A. liebrechtsiana *De Wild & Th. Dur.* in Compt. Rend. Soc. Bot. Belg. **38,** 96 (1899) ; Bak. in Fl. Trop. Afr. **4** (**1**), 540 (1903).

A. baertsiana De Wild & Th. Dur. in Bull. Herb. Boiss., Sér. 2, **1,** 829 (1901) ; Fl. Trop. Afr. l.c. 625.

A. gossweileri Exell in Journ. Bot. **67,** Suppl. **2,** 101 (1929).

This species is characterised by the comparatively narrow, elongate-oblanceolate, petiolate leaves, the small calyx, which is constricted at the mouth, the slender inflorescence branches, the absence of spines, the funnel-shaped corolla-tube and short corolla-lobes which are about half the length of the tube. A specimen from Eala, Belgian Congo has a larger calyx which is less constricted at the mouth and may possibly be a hybrid between this species and *A, schweinfurthii* (see map, Fig. 4).

Fig. 4. Map showing distribution of A. liebrechtsiana & possible hybrid.

Southern Nigeria : Omo about 2 miles SW. of Osho, *Jones & Onochie* in *F.H.I.* 17264 ! ; Akilla, Oni River, *Kennedy* 2364 !

French Cameroons : South Kongola, *Mildbraed* 9001 !

Belgian Congo : Lukolela, *Dewevre* 829 (holotype of *A. liebrechtsiana* in BR !) Kisantu, *Gillet* 56 (holotype of *A. baertsiana* in BR !) ; between Kutu & Lukolela, *Lebrun* 6622 !

Northern Rhodesia : Balovale District : on large island of sand in Zambezi River, off Shingi village, 7 miles north of Chavuma, *Angus* 642 ! ; Livingstone District : Katombora, *Brenan & Morze* 7740 !

Angola : Zaire District : Congo Iala, *Gossweiler* 8636 (holotype of *A. gossweileri* in BM ! ; isotype in K !).

5. A. schweinfurthii *Gilg* in Engl., Bot. Jahrb. **17,** 579 (1893) ; Bak. in Fl. Trop. Afr. l.c. 541.

[*A. inermis* (non Engl.)—Bak. l.c. 541, *quoad spec. Lower Congo, Smith* !].

[*A. nobilis* (non G. Don)—Bak. l.c. 539, *quoad spec. Niamniam, Schweinfurth* 3037 !, 3726 !].

? *A. stuhlmannii* Gilg in Engl. Jahrb. l.c. 580 ; Fl. Trop. Afr. l.c. 540.

A. niamniamensis Gilg l.c. 580.

A. magnifica Gilg l.c. 581 ; Bak, l.c. 541.

A. squamata De Wild. & Th. Dur. in Bull. Herb. Boiss., Sér. 2, **1,** 829 (1901) ; Bak. l.c. 625.

A. insulana S. Moore in Journ. Linn. Soc. **37,** 186 (1905).

? *A. laurentii* De Wild. in Miss. E. Laurent **1,** 262 (1906).

A. pynaertii De Wild. in Ann. Mus. Congo, Sér. 5, **3,** 251 (1910).

? *A. gigantea* Gilg in Wiss. Erg. Deutsch. Cent.-Afr. Exp. 1907-8, **2,** 533 (1913).

A. oubanguiensis Aubr. & Pellegrin in Bull. Soc. Bot. Fr. **100,** 25 (1953).

I have examined the above type specimens with the exception of *A. stuhlmannii* and *A. gigantea*, which were unfortunately destroyed during the war. From the descriptions and distribution of these two latter species, I am of the opinion that they are probably not distinct from *A. schweinfurthii*. With regard to the other species listed above, I have the following comments to make.

The type of material of *A. niamniamensis* in the Kew Herbarium is very inadequate, consisting of only two leaves and a small piece of branch, the leaves are, however, petiolate and the branch without spines, both features of *A. schweinfurthii*. This together with the fact that the specimen was collected in the same region as *A. schweinfurthii* leads me to believe that they are one and the same species.

Although the type material of *A. magnifica* has rather more conspicuous leaf-scars it shows the typical spineless branches, obovate petiolate leaves and tapering flower buds of *A. schweinfurthii*.

The type specimen of *A. insulana* (*Bagshawe* 638) is represented by one large leaf, some young leaves, on lateral shoots below the inflorescence, the inflorescence branches and about three loose broken flowers. This has the typical calyx, tapered bud and short inflorescence of *A. schweinfurthii* but has more or less sessile leaves. (For position of this species see discussion on hybridisation below).

The type specimen of *A. laurentii*, on loan from Brussels, is represented by one detached leaf and some broken corollas and is difficult to place with certainty, but taking the geography into account I believe that it is best placed here. The types of *A. squamata*, *A. pynaertii* and *A. oubanguiensis*, though differing in minor points agree very well with the type material of *A. schweinfurthii* at Kew. It is true that if some of the above species were compared among themselves without reference to other material they might very well be regarded as distinct, but if the whole range of material in its different stages is taken into account I feel there is little doubt that only one species is involved. There are, however, one or two anomalous cases in which hybridization may have occurred :—At the western limit of distribution, in Southern Nigeria and the Cameroons, there are two specimens (*Kennedy* 2131 and *Mildbraed* 7591), which have the leaves. fruits and flowers of typical *A. schweinfurthii*, but possess incipiently spiny branches. It is possible hybridization has occurred in this case between *A. schweinfurthii* and either *A. vogelii* or *A. djalonensis*,

both of which have spines. Again North & West of Lake Victoria there are some specimens (*Eggeling* 4061, 6237 ; *Dawe* 950 ; *Bagshawe* 638 ; *Schenkel* 270), which, though having the characteristic fruits and/or flowers of *A. schweinfurthii*, have sessile or subsessile leaves, and in this respect look rather different from typical *A. schweinfurthii*. At first I thought that perhaps hybridization had taken place between this species and either *A. vogelii* or *A. zambesiaca* both of which have sessile leaves. However, I have recently been able to examine some excellent and abundant material collected by Drummond & Hemsley at Katera, Masaka District, Uganda (No. 4504). This material shows a great range in leaf size, shape and petiolation. The upper inflorescence leaves are comparatively small, obovate, and very definitely petiolate and exauriculate, the lowest leaves are elongate-oblanceolate, and up to 80 cm. long, sessile and auriculate, and intermediate leaves occur of varying shapes, sizes, petiolation and auriculation. This evidence shows that there is a very great range of leaf-variation within the species, and the specimens quoted above come within the range of the species.

Fortunately the type of *A. schweinfurthii* is represented at Kew by four excellent specimens, including flowers, fruits and young and mature leaves. This, together with *Drummond & Hemsley* 4504, makes possible comparison with other species founded on less adequate material. The typical species is recognised by its unarmed branches, obovate to oblanceolate, subcoriaceous, petiolate upper leaves, rather conspicuous bracts, tapering flower-buds, comparatively large, smooth, clasping calyx, and usually short inflorescence. The species has a very extensive distribution as can be seen by the citations below and the map, Fig. 3.

Southern Nigeria : Sapoba, *Kennedy* 2131 ! (possible hybrid) & 2136 !

Ubangi-Shari : Ouaka District : Ippy, *Tesserant* 1934 (holotype of *A. oubanguiensis* in P !) ; close to source of Soni River, just across the Sudan frontier from the source of Yubi River, *Hoyle* 730 !

French Cameroons : Between Bipindi & Ebolowa, *Mildbraed* 7591 ! (possible hybrid).

Gaboon : Munda, Sibange Farm, *Soyaux* 49 (isotype of *A. magnifica* in K !).

Congo : Without locality, *C. Smith* s.n. ! (specimen quoted in original description of genus, see footnote[1]).

Belgian Congo : Lukolela, *Laurent* s.n. (holotype of *A. laurentii* in BR !) ; Eala, *Pynaert* 855 (holotype of *A. pynaertii* in BR !) ; Kimuenza, *Gillett* 1773 (holotype of *A. squamata* in BR !) ; Rutshuru, *Ghesquiere* 3691 ! ; Yangambi, *Louis* 3100 ! ; 7873 !

Anglo-Egyptian Sudan : Niamniamland : Mbrwole, *Schweinfurth* 3726 (isotype of *A. schweinfurthii* in K !) ; Mbanga, Boddo, *Schweinfurth* 3037 (isotype of *A. niamniamensis* in K !) ; Lado, Yei River, *Sillitoe* 307 !

Uganda : Masaka District : Sese, Bugala, Sozi Point, *Eggeling* 89 (F.D. 262) ! ; Bugala Island, Kalangala, *M. S. Philip* 433 ; Mengo District : Lake Victoria, Buvuma Isl., *Bagshawe* 638 (holotype of *A. insulana* in BM !).

[1] R. Br. in Tuckey, Congo, App. 440 (1818).

Tanganyika : Buha District : Malagarasi Pontoon Camp, *Bullock* 3223 !

Northern Rhodesia : Fort Roseberry District : Lake Bangweulu, near Samfya, *Angus* 291 ! 276 !

6. A. zambesiaca *Bak.* in Kew Bull. **1895,** 99 (April 1895) ; Bak. in Fl. Trop. Afr. **4** (**1**), 540 (1903) ; Prain & Cummins in Fl. Cap. **4** (**1**), 1049 (1909).

A. insignis Galpin in Kew Bull. **1895,** 150 (June–July 1895).

A. orientalis Gilg in Engl., Pfl. Ost. Afr. **C,** 312 (Aug. 1895) ; Bak. in Fl. Trop. Afr. l.c. 539.

A. pulcherrima Gilg in Engl., Bot. Jahrb. **30,** 375, t. 17 (1901) ; Bak. l.c. 540.

A. keniensis Summerhayes in Kew Bull. **1926,** 244 (1926).

I have examined the types of *A. insignis* and *A. keniensis* in the above synonymy :—The types of *A. orientalis* (*Stuhlmann* 6092) and *A. pulcherrima* (*Goetze* 1313) were unfortunately destroyed at Berlin and no duplicates have been traced in other Herbaria for examination. From the descriptions of these two latter species and from examination of other material collected since in an area not far from the original localities, I am of the opinion that they are both synonymous with *A. zambesiaca.*

It is interesting to note that Prain & Cummins in the Flora Capensis (see above) reduced *A. pulcherrima* to synonymy. The only specimen they cited under *A. zambesiaca* was *Leyson in Herb, Galpin* 1891, the type gathering of *A. insignis*, a species which they had inadvertently overlooked. There are six sheets of this in the Kew Herbarium, which compare very well with the two type sheets of *A. zambesiaca.*

The type material of *A. keniensis* consists of leaves, immature fruits and one broken flower and bud. The beaked or umbonate young fruits, the spreading calyx-lobes and the sessile or subsessile leaves with rather conspicuous tertiary venation, characteristic of this material is also a feature of the type material of *A. insignis.*

A. zambesiaca shows a considerable amount of variation in the following points :—leaf-shape, size, texture, apex-shape, the angle the lateral nerves make with the midrib, the relative length of the corolla-lobes with respect to the tube and the shape of the outer calyx-lobes in the flowering stage (this latter difference in shape is probably due to drying). The distinctive characteristics of the species in the dried material are :—the pointed or umbonate young fruits, the fleshy rugulose outer calyx-lobes in the flowering stage, the spreading lobes in fruit, the sessile or subsessile, usually membranous, leaves with conspicuous tertiary nerves and crinkled margins, and the absence of spines. I have recently examined spirit material of flowers and fruits of this species, collected by *Drummond & Hemsley* in the Eastern Usambaras (No. 3458), the fruits are narrowly ovoid and rounded not pointed at the apex and the calyx-lobes, though small and fleshy, are clasping not spreading, so that the characteristic pointed fruits and spreading calyx-lobes so noticeable in dried material are presumably not visible in the living plant. This species is distributed

through eastern Africa from Uganda southwards to the Transvaal (see map, Fig. 5).

Belgian Congo : Ruwenzori, Mubuku Valley, *Lebrun* 4421 ! ; Biega, *Hendrickx* 4098 !

Uganda : Mbale District : West of Mt. Elgon, Ngongora Ridge, *Dale* U78 ! ; Toro District : Ruwenzori, Mubuku Valley, *Eggeling* 1257 ! ; Ankole District : Kalinzu Forest, *Eggeling* 3647 !

Kenya : Kericho District : Sotik, *Battiscombe* 1301 (holotype of *A. keniensis* in K !) & *Battiscombe* 698 ! ; Meru/Embu District : near the Mutonga River, *R. E. & Th. C.E. Fries* 1902 !

Tanganyika : Rungwe District : Kyimbila, *Stolz* 497 ! ; Lushoto District : E. Usambaras, Amani, Kwamkoro road, *Verdcourt* 225 ! ; near Amani, *Braun* 1082 ! ; Kwamkoro, *Drummond & Hemsley* 3458 !

Zanzibar : *Vaughan* 997 ! ; *Burtt Davy* 22641 !

Portuguese East Africa : Mufucia Forest, *Dawe* 472 !

Fig. 5. Map showing distribution of A. zambesiaca & A. procera.

Nyasaland : Shire Highlands, *Buchanan* 84 (holotype of *A. zambesiaca* in K !) ; Koto-Kota District : Nchisi, *Brass* 17072 ! ; Zomba Mt., *Clements* 21 ! ; 317 !

Southern Rhodesia : Chipinga, near " Eastley ", *Kelly-Edwards* E.36/32 !

Swaziland : Horo Forest, *Leyson in Herb. Galpin* 1358 (isotype of *A. insignis* in K !).

Transvaal : Pietersburg District : The Downs, *Moss & Rogers* 248 ! ; Barbeton, Kamshlaban, *Thorncroft* 2214 !

Note : There is a specimen *Humblot* 311 from the Comoro Islands, which is very similar to *A. zambesiaca* in the sessile rather membranous leaves with visible tertiary nerves, the pointed fruits and in the general size and form of the inflorescence and the shape of the buds. It differs

in the more clasping calyx-lobes and shorter corolla-tube. It would be interesting to have further material from this locality so that the relationship to *A. zambesiaca* could be more clearly ascertained.

7. A. procera *Lepr. ex Bureau*, Thèse Logan. 74–77 (1856) ; Bak. in Fl. Trop. Afr. in obs. sub *A. parviflora* l.c. 539.

[*A. nobilis* (non G. Don)—Bak. l.c. *quoad spec. Senegal, Leprieur*].

A. frezoulsii A. Chev. in Bull. Soc. Bot. Fr. **54,** Mem. **8,** 47 (1908 ; Fl. West Trop. Afr. l.c. 18.

This species has been published in rather an unorthodox form ; the description of it together with that of *A. vogelii* is interpolated within the generic description. In spite of this rather unusual arrangement I have no hesitation in saying that the specific epithet is validly published.

A. procera is closely allied to *A. zambesiaca* in leaf-form and texture and in the absence of spines. It differs in the elongate, spreading, drooping fruiting inflorescence and the broader more or less lobed fruits, which are rounded, not pointed at the apex in the dried material. The corollas are also longer and narrower with comparatively short lobes and the calyx-lobes are also shorter. For distribution see map, Fig. 5.

Gambia : Kombo, *Heudelot* 109 (holotype of *A. procera* in P !, isotype in K !) ; Lamin, *Rosevear* 1 !

French Guinea : Conakry, *Chevalier* 12162 ! (holotype of *A. frezoulsii* in P !).

Sierra Leone : Njala, *Deighton* 1809 ! ; Musaia, *Deighton* 5481 !

Southern Nigeria : Lagos, comm. *Imperial Institute* 10 !

Doubtful Species

Unfortunately the types of the following species have been destroyed and no duplicates have been traced :

8. A. inermis *Engl.* in Engl., Bot. Jahrb. **8,** 63 (1887).

Angola : Zaire District : Island near Ponta da Lenha, 6 Sept. 1874, *Naumann* s.n.

This species is characterised by having lanceolate to elongate-lanceolate, petiolate leaves, about four times as long as broad, rather short sepals, 6–7 mm. long, and unarmed branches. In my opinion the species is synonymous with either *A. schweinfurthii* or *A. liebrechtsiana* but there is not sufficient evidence to determine which one so I am treating the name as a *nomen dubium.*

9. A. kamerunensis *Gilg* in Engl., Bot. Jahrb. **28,** 125 (Dec. 1899).

French Cameroons : Batanga, *Dinklage* 1361.

This species is characterised by petiolate oblong or obovate-oblong comparatively small leaves about two and a half times as long as broad, a 5 cm. long corolla with the lobes slightly shorter than the tube and sparsely spiny branches. This species from description appears very similar to *Mildbraed* 7591 named *A. kamerunensis* at Berlin. I have already mentioned this specimen under *A. schweinfurthii* as being a possible hybrid.

10. A. lanceolata *Gilg* in Engl., Bot. Jahrb. **28,** 125 (Dec. 1899).

French Cameroons : Batanga, *Dinklage* 1114.

This species is characterised by sessile, lanceolate or obovate-lanceolate leaves, about six times as long as broad ; rather large, 13 mm. long sepals and a corolla in which the lobes are slightly longer than the 13 mm. long tube and spiny branches. From description the species appears very closely allied to or may very probably be *A. vogelii.*

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Ehrenberg's letters.*—Christian Gottfried Ehrenberg (1795–1876) was a prolific writer not only on botanical but on other scientific subjects. There has just been published a large number of letters written by him and by Hemprich on or connected with their journey to Egypt and Libya. The letters date from 1819 to 1826 and are arranged chronologically. The letters will be of some use to botanists who have to consult the specimens collected by Ehrenberg. A set of these was received at Kew in 1864 and the mounted sheets are incorporated in the Kew Herbarium.

W. B. Turrill.

* E. Stresemann : Hemprich und Ehrenberg, Abhandl. deut. Akad. Wiss. Berlin, Kl. Math. allg. Naturwiss, 1954, Nr. 1, pp. 1–177.

THE CORRECT SPELLING OF CHONDODENDRON.

N. Y. Sandwith

Ruiz and Pavón's original spelling *Chondodendron*, for the name of this chemically important genus of *Menispermaceae* (see Fl. Peruv. et Chil. Prodr. 132, ann. 1794), has been adopted by most recent authors in botanical literature although the form *Chondrodendron* was used by Sprengel (Syst. Veg. **2,** 155, ann. 1825, the generic name being in synonymy), by Miers (1871), by Prantl in the Pflanzenfamilien (**3,** 2, p. 90, ann. 1888), and by Lemée (Dict. Phan. **2,** 134, ann. 1930). Diels, in the Pflanzenreich (**4,** 94, p. 78, ann. 1910), wrote *Chondodendron*, while giving in a footnote the original authors' derivation of the name (was this deliberate, or had Diels no Greek ?). Krukoff and Moldenke, in their paper on arrow-poison *Menispermaceae* in Brittonia, **3,** 11, adnot. (1938), remarked that " this name has frequently been spelled *Chondrodendron* in literature, but there seems no reason to change the original spelling." This remark is surprising. There is, in fact, a compelling reason for changing the original spelling, as was clearly pointed out by Miers as long ago as 1871 (Contr. Bot. **3,** 307, adnot.).

Ruiz and Pavón stated that they called their new genus *Chondodendron* because of the " abundance of burrs " (*granorum copia*) on the trunk and branches of the " tree " (species of this genus are always woody climbers). It is therefore clear that the name is derived from the Greek χόνδρος, noun, " burr " (or, in adjectival form, χονδρός, " granular ", " burred "), and δένδρον, " tree ", and the name should have been spelled *Chondrodendron*. The error was not necessarily the printer's, as was suggested by Miers, but more likely the authors', since it was repeated in their Syst. Veg. Fl. Peruv. et Chil., p. 261, in 1798. We need not assume that the malformation of χονδρο– was intentional for the sake of euphony : *Chondrodendron* is not difficult to pronounce and is certainly less ugly and tongue-twisting than the name *Aextoxicon* in the same work ; while no other possible instance of such a deliberate malformation for the sake of euphony can be found there. We may assume that the error was unintentional since the rest of the names derived from Greek words, although not always carefully formed (the guttural stem of the first word, when a Greek noun of the third declension, was not always properly used for forming a compound : e.g. *Aextoxicon* would have been better written *Aegotoxicon*, *Calyplectus* should have been *Calycoplectus*), were correctly transliterated (except for " *Embotrium* ", pp. 15, 151, which was, however, correctly spelled *Embothrium* in the Systema in 1798). There is no Greek or Latin word with stem χονδο- or chondo-.

In view of the above remarks, I propose that the original spelling *Chondodendron* be treated as an " orthographic error " under Article 82 of the International Code of Botanical Nomenclature, and that Miers' corrected spelling **Chondrodendron** be adopted in future for this genus. The matter has recently been raised with the Chemical Society by the editor of a series of monographs on alkaloids, and some botanists are perhaps unaware that Dr. Harold King, when he began his series of papers on Curare alkaloids in 1935, adopted the spelling *Chondrodendron* on the advice of Kew (see Journ. Chemical Soc. 1935, p. 1381, adnot.) and has used it ever since.

TWO NEW SPECIES OF MONOCOTYLEDONES FROM GREECE.

Crocus goulimyi *Turrill* ; a *C. laevigato* Bory et Chaub. et *C. cretense* Körnicke stigmatibus simplicibus apice brevissime irregulariter lobatis haud valde fissis recedit.

Cormus ovoideus, 3·5 cm. longus, 2 cm. diametro, tunicis coriaceis laevibus haud fibrosis vel reticulatis haud circumcissis sed apice basique longitudinaliter fissis intus valde nitentibus obtectus. *Folia vaginantia* circiter 4, membranacea. *Folia viridia* 4–5, sub anthesi supra vaginas valde exserta, linearia, 10–14 cm. longa, 1 cm. lata, tenuia, glabra. *Spatha* triphylla (? an semper), membranacea. *Flores* singuli. *Perianthium* tubo 12–13 cm. longo 1 mm. diametro tenui, fauce glabrum, tepalis 6 subaequalibus obovatis apice rotundatis circiter 2·7 cm. longis 1·5 cm. latis nervis principalibus plus minusve 15. *Stamina* filamentis 8 mm. longis, antheris 14 mm. longis flavis. *Styli* rami 3, 5–7 mm. longi, aurantiaci, simplices, apice dilatati brevissime irregulariter lobati.

Greece : southern Peloponnese, Mani district, 15 Nov. 1954, *C. N. Goulimy* (*Goulimis*). Holotypus in Herb. Kew.

The tunics of the corms of this interesting crocus are very similar to those of the corms of *C. laevigatus* Bory et Chaub., from Attica and several of the Cyclades Islands (also recorded from Euboea, Argolis, and Crete) and *C. cretensis* Körnicke from Crete. The former has been figured and described anew in the Botanical Magazine, t. 9515 (1938) and the separation of *C. cretensis* Körnicke from the Cyprian *C. veneris* Tapp. is clearly made in Phyton **1,** 223–4 (1949). Both *C. laevigatus* and *C. cretensis* have the stigmatic portions of the three style arms deeply divided (stigmatibus in lacinias tenues pluries multifidis).

Dr. Goulimy informs us that he collected the material right and left of the main road leading from Gythion to Areopolis. He " encountered the first specimens about a quarter of a mile south of a small hamlet which is called Vachos at an altitude of about 400 meters. The new crocus was growing however more plentifully farther south about a quarter of a mile north of Areopolis. The ground in all that country is a mixture of stones and red clay. I collected the best specimens on the border of fields which had been superficially tilled and sown with wheat.—The colour of the tepals is blue-mauve ".

Tulipa goulimyi *Sealy et Turrill* a *T. hageri* Heldr. bulbi tunicis in pagina adaxiale densissime rufescenti-lanatis facile distinguitur.

Bulbus ovoideus vel elongato-ovoideus, 5–6·5 cm. longus, 2–3 cm. diametro, tunicis in pagina adaxiale densissime rufescenti-lanatis. *Caules* 1–2·6 dm. alti parte subterraneo 6–12 cm. longo incluso, superne 2–2·5 mm. crassi, glabri, uniflori, interdum flexuosi. *Folia* 5–7, linearia vel lineari-lorata, subacuta vel subobtusa, 1–2 dm. longa, 1·5–20 mm. lata, margine haud ciliolata, saepissime undulata, glabra. *Tepala* fere aequalia, oblanceolata, apice obtusa vel rotundata, breviter apiculata, inferne angustata, 3·8–4·5 cm. longa, 0·9–1·4 cm. lata, ima basi ciliata. *Filamenta* 1·2 cm. longa, tenuiter subulata, basi albo-barbata ; antherae dehiscentes oblongae, 9 mm. longae. *Gynoecium* 1·3 cm. longum.

Greece : Island of Kythira, village Potamos, near Prophet Elia (cemetery), stony ground, 2–7 April 1954, *C. N. Goulimy* (*Goulimis*). Holotypus in Herb. Kew.

In most modern classifications of the genus *Tulipa*, two main series are accepted : *Eriostemones* with hairs on the usually enlarged base of the filaments, and *Leiostemones* with completely glabrous filaments. *T. goulimyi* must, on this character, be placed in the former group for the bases of the filaments are clearly provided with a " beard " of white hairs. In many characters it recalls *Tulipa hageri* Heldr., a species originally described from Mt. Parnes, Attica, but is at once distinguished by its larger bulbs and densely villose or lanate bulb-scales. The same character also separates it clearly from *T. orphanidea* [Boiss. ex] Heldr. from Mt. Malevo in Laconia and also known from Mt. Parnes and other localities in Attica and from Argolis.

Within the *Eriostemones* there are a few species with bulb-tunics more or less woolly, e.g. *T. buhseana* Boiss., *T. callieri* Hal. & Lev., *T. dasystemonoides* Vved., and *T. polychroma* Stapf, but they are quite different from *T. goulimyi* in other respects, being much smaller plants with only two leaves and differently coloured flowers, the tepals being white with yellow base and flushed with green or purple on the back. There is, however, one species (or hybrid) of the *Eriostemones* which agrees, *e descriptione*, with our plant in having large reddish flowers and bulb-tunics rufous-lanate, namely *T. giselae* Bornm. from the Elburz Mts. of Persia. No specimens of this interesting plant, which Bornmüller thought might represent a hybrid between *T. montana* var. *chrysantha* (*Leiostemones*) and *T. violacea* (*Eriostemones*) have been available for examination, but it seems to differ from our plant by its usually fewer (4 or 5 not 5–7) leaves, broader tepals 2·2–2·5 cm. wide without a blue-black blotch, and shorter stamens only 1·3 cm. long.

Bulb-characters " cut-across " the filament-character in *Tulipa*, and there is a group of species with glabrous filaments whose bulbs are densely woolly just like those of *T. goulimyi*. These are the species which form section *Tulipanum* Reboul (*Eriobulbi* Baker), a section characterised, within the *Leiostemones*, by its bulb-tunics being densely woolly on the inner side. None of these species agrees with *T. goulimyi* sufficiently to suggest affinity, and there can be little doubt that the true affinity of this last is with *T. hageri*, and perhaps *T. giselae*, in the *Eriostemones*.

Attention must be drawn to *Tulipa doerfleri* Gandoger (Fl. Cret. 102 : 1916). No authentic material of this has been seen and the original description is meagre in the extreme. Hayek (Prod. Fl. Penins. Balc. **3,** 70 : 1932) reduces it to a variety of *T. hageri* Heldr. If this reduction be acceptable one must assume that the bulb is very different from that of *T. goulimyi*. There is in the Kew Herbarium a specimen of a tulip collected by M. Ogilvie Grant in April 1938, in Crete at Rethymnon, beneath olive trees. The type specimen of *T. doerfleri* is said to have come from Rethymo, in monte Khedros, H. Vasilis, *Doerfler* 182. The Ogilvie Grant material agrees well with the description (so far as it goes) of *T. doerfleri* but has no bulb. In addition to possible distinguishing features of the bulb, it differs from *T. goulimyi* in having three flat (not undulate) leaves, stouter filaments, shorter anthers, and a thicker gynoecium.

Living material of *T. goulimyi* has not been seen and the following notes on the flower-colour have been drawn up from the dried material. That some changes in colour have taken place in the process of drying is probable but these may not have been great : Tepals (excluding basal claw) with a yellow background on which is super-imposed a red colour varying in different flowers from Spinel Red to Dark Maroon Purple (Ridgway, Color Standards, Plate XXVI.) ; claw generally flushed with greenish blue-black. Filaments bluish-black in most of their length ; polliniferous anthers yellow. Gynoecium dark purplish.

Album de Redouté.*—Pierre Joseph Redouté, the most celebrated flower painter of his time, the " Raphaël des Fleurs ", came of a family of painters. He was born on the 10th July, 1759 at Saint Hubert, Belgium, being the second son of Charles Joseph Redouté who was himself a painter and executed tableaux and other religious works to decorate the abbey at Saint Hubert. Redouté counted among his friends many botanists including Ventenat, Desfontaines, De Candolle, Michaux, and was at one time a pupil of l'Héritier. Ventenat named the genus *Redoutea* after him, but this name is now regarded as a synonym of the earlier *Cienfuegosia* Cav.

Redouté illustrated many works by the botanists of his day and publication of his most famous work " Les Roses ", with the text by Thory, was begun in 1817. He eventually became flower painter to Marie Antoinette and served for some years in a similar capacity to the Empress Josephine. In 1824 he published the " Album de Redouté " which he dedicated to another of his patronesses, the Duchesse de Berry. A new edition of this work has now been published by Messrs. Collins.

The Album contains 25 coloured plates reproduced from Redouté's earlier works. For instance, there are 5 from " Les Roses ", 18 from " Les Liliacées ", 1 from " Plantarum Succulentarum Historia ", and 1 from " Jardin de la Malmaison ". The list of contents at the beginning of the volume gives the sources of these plates. Sacheverell Sitwell contributes an interesting account of Redouté's pictures and Roger Madol a biography. There is also a valuable Redouté bibliography by Madol, compiled with the assistance of W. T. Stearn, which contains useful information on their dates of issue.

The plate which forms the frontispiece, a wreath of roses, is a reproduction of the plate which served as a frontispiece to Redouté's original " Les Roses ". In its original form this wreath or garland of roses encircled a passage from one of the odes of the lyric poet Anacreon, a translation of which reads : " Crown me, then, and I will play the lyre by your shrines, Dionysus, with deep-bosomed Persephone ; I will dance, wreathed in garlands of roses ". In its adoption as a frontispiece to the Album de Redouté it surrounds the prosaic inscription "Album de

* Album de Redouté. Sacheverell Sitwell and Roger Madol. London : Wm. Collins, Sons & Co. Ltd. Pp. 20 × 25 col. pls. Price £10 10s. 0d.

Redouté. Peintre de Fleurs, Professeur au Musée d'histoire Naturelle. Chevr de la Legion d'Honneur."

This is indeed a sumptuous edition although the colouring of the plates does not seem to be so brilliant as in the copies of Redouté's works in the Kew library with which the reviewer has compared them, but possibly the plates in the original works varied a little in different copies. It seems a pity that the paper on which the plates are printed is not completely opaque as this would have prevented the shadowy figure of the plate beneath from showing through. According to Madol's account of his life, Redouté is said to have been 81 years old when he died. Actually he died on the 19th June 1840 a few weeks before reaching his 81st birthday.

Apart from these few criticisms the format of the book, the paper, and the type, all combine to set a high standard of excellence, resulting in a production which will give considerable pleasure to those who take a delight in the beauty of flowers and their artistic presentation.

H. S. Marshall.

The Arnold Arboretum Garden Book.*—The Arnold Arboretum was formed in 1872 for the cultivation and study of the woody plants of the world, and since that date has introduced many thousands of such plants into America.

In 1911 its official publication, the *Bulletin of Popular Information*, was first published and continued to appear under this title until 1941 when the name was changed to *Arnoldia*. Many articles of interest to garden lovers have been published in its pages and the book under review is made up of about 45 numbers of Arnoldia gathered together and issued as "The Arnold Arboretum Garden Book". These numbers were originally published in *Arnoldia* during the years 1936–1953 but the majority have appeared there in recent years. Chapter I deals with the foundation of the Arboretum and gives brief accounts of well known personalities including Charles Sprague Sargent, its first director, E. H. Wilson and Alfred Rehder, men who were intimately connected with it and have made considerable contributions to its well-being.

There is an interesting account of the Arboretum to-day, where more than 6,000 different kinds of woody plants are being grown, describing the work in which it is engaged together with information on the Herbarium, Library and the many publications which have been written by members of its staff. The other 15 chapters deal with Vines, Azaleas, Rhododendrons, Lilacs, Forsythias, Roses, Viburnums, Cherries, Dwarf Trees and the history of the discovery of *Metasequoia*. This very interesting book is provided with a useful index and a map showing the "hardiness zones" of the United States & Canada, is well illustrated, and will appeal to those who have an interest in ornamental woody plants.

H. S. Marshall.

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* The Arnold Arboretum Garden Book. By Donald Wyman. Pp. viii + 354 + 76 pls. New York, Toronto & London : D. van Nostrand Co., Inc. Price 42/-.

NOTES ON CYPERACEAE : XXXIII*.

E. Nelmes

The African Species of Hypolytrum.

Of the several genera which form the tribe *Hypolytreae* Nees, *Hypolytrum* and *Mapania* are a closely related pair. Both, with about 50 species each, are much larger than their allies in the tribe, the number of whose species range from one to six. Large wide leaves and large panicled or capitate inflorescences are striking features of both genera.

The preparation of *Hypolytrum* for the Flora of Tropical East Africa revealed the need for a revision of the African species and this is attempted below. The work has been handicapped by the loss in Berlin during the second world war of several types, a state of things which also hinders the author's study of African *Mapania*. This difficulty, however, is not confined to the *Cyperaceae* !

In *Hypolytrum* as in many other genera of *Cyperaceae* there are the species vegetatively robust and with large loose panicles of spikes at one end of the scale descending to smaller plants with more or less sessile capitate spikes at the other end. *Mapania*, though exhibiting general reduction of size, has an inflorescence densely capitate throughout. There is, however, at least one strikingly similar reductive pattern in the two genera. Each of them, as far at least as the African species are concerned, is about equally divided between (a) plants with comparatively stout stems arising centrally from a tuft of leaves, and bearing stem leaves and leafy bracts, and (b) those with slender stems arising laterally, either from the axils of lower leaves of a short shoot, or below the leaves (postphyllary-axillary), or more truly lateral from a separate basal shoot on the rhizome, with bracts not leafy but quite small and ferrugineous or brownish-green, and the stem scapiform with no leaves.

Tropical African *Hypolytrum*, in common with most other African groups of *Cyperaceae*, has not been much studied since the time of C. B. Clarke, about half a century ago. The only worker of note on this group during this long interval was H. Chermezon of Strasbourg, who, besides describing a number of new species, chiefly from Gabon, included two species and two varieties in his " Révision des Cypéracées de Madagascar, 3me Partie, 1936 ".

Until recent years one could easily distinguish *Hypolytrum* from *Mapania* in tropical Africa by the inflorescence alone, that of *Hypolytrum* being always more or less loosely corymbiform and that of *Mapania* invariably densely capitate. Chermezon, however, between 1930 and 1936 described *H. gabonicum* and its var. *plicatum*, both of which have a densely capitate inflorescence. Their fruit is much larger than that of any other African *Hypolytrum*, and it has a distinct and long beak. Otherwise they seem to have *Hypolytrum* characters, except for the presence of tubercles on the fruit which is more common in *Mapania*. The immature *H. scaberrimum* is closely related. *H. rhizomatanthum* Cherm. and *H. elatum* (Cherm.) Nelmes have somewhat less capitate inflorescences and more typical *Hypolytrum* fruits, though these species are not yet well-known to

* Continued from K.B. 1954, 522 (1955).

me, and for this reason I leave them for the present in *Hypolytrum*, although there may be a new genus here, distinct from both *Hypolytrum* and *Mapania*, but with characters linking it with each.

The following abbreviations are used for the herbaria from which I have seen and cited specimens : AA, Arnold Arboretum ; B, Berlin ; BM, British Museum (Natural History) ; BR, Brussels ; EA, East African Herbarium, Nairobi ; K, Kew ; LeT, Herb. Le Testu ; MO, Missouri Botanical Garden ; NY, New York Botanical Garden ; US, Smithsonian Institution ; and YBI, Yangambi.

Hypolytrum

L. C. Rich. in Pers. Syn. 1 : 70 (1805).

Perennial herbs with an elongated horizontal or descending usually rather stout *rhizome*, clothed with glumiform scales. *Stems* erect, trigonous, central and solitary and leafy, or axillary and several and scapiform. *Leaves* mostly basal and sub-basal and usually several higher on the flowering stem, or all closely situated on a short or shortish shoot which does not develop into a flowering stem, large, usually flat or flattish, linear to oblong and usually lanceolate, rarely oblong-elliptic, papyraceous or coriaceous, glabrous, sometimes septate-nodulose, basal ones not sheathing or sheaths ruptured during development of the flowering stem, stem leaves sheathing the stem, apices acuminate or attenuate. *Spikes* usually numerous or very numerous, sometimes few, ovoid, ellipsoid or cylindric, sometimes becoming subglobose in fruit, densely spiculate, in sessile or shortly pedicelled clusters, disposed in terminal, bracteate, corymbiform *panicles*, rarely capitate. *Bracts* from leaflike to small, brown, and glumiform, none sheathing. *Glumes* usually more or less oblong with a rounded apex, flattish to cymbiform, densely and spirally imbricate, more or less coriaceous, glabrous and smooth, apex muticous or midrib slightly excurrent, all with a spikelet in their axils except for several empty ones at the base of the spike. *Spikelets* usually formed of 2 opposite, hyaline, navicular, ciliate- or hispidulous-keeled, monandrous male scales, similar in appearance in all the species, 2–4 mm. long, usually delicately fused together but readily rupturing as the fruit develops, and a terminal, scaleless female flower. *Achenes* biconvex, ovate, elliptic, or obovate, smooth, costate, or wrinkled, sometimes reddish spotted, rarely tubercled. *Style* deeply bifid, base scarcely or slightly thickened.

The above generic description is tentative and will probably need some modification when comparative study is made of allied genera.

Artificial Key to the African species of *Hypolytrum*.

1. Stem central ; lower bracts foliaceous or subfoliaceous and, with the upper stem leaves, overtopping the inflorescence :
2. Lower bracts subfoliaceous and, with the upper stem leaves, only slightly overtopping the inflorescence ; glumes sometimes acuminate above, apex acute to obtuse, 3–4·5 mm. long 9. *H. cacuminum*

2. Lower bracts foliaceous and, with the upper stem leaves, far overtopping the inflorescence ; glumes not acuminate, apex rounded, 2–3·25 mm. long :

3. Stem arising centrally from a few soon withered cataphylls ; leaves 6–10, none basal, usually confined to the upper two-thirds of the stem, upper ones oblong-elliptic . . . . 1. *H. lancifolium*

3. Stem arising centrally from a tuft of basal foliage leaves or leafless sheaths ; 1–3 other leaves situated at intervals on the stem above, none oblong-elliptic :

4. Leaves 2·5–4 cm. wide ; spikes 8–12 mm. long ; glumes mottled 2. *H. polystachyum*

4. Leaves 0·8–3·5 cm. wide ; glumes not mottled :

5. Spikes 9–12 mm. long ; achenes wholly wrinkled 3. *H. chevalieri*

5. Spikes 3–8 mm. long ; achenes not wrinkled above :

6. Achenes slightly constricted above the middle . 7. *H. testui*

6. Achenes not constricted :

7. Leaves 1·3–3·5 cm. wide ; inflorescence 3–20 cm. broad ; achenes 2–2·5 mm. long . . . . . 4. *H. purpurascens*

7. Leaves 0·8–1·7 cm. wide ; inflorescence 3–6 cm. broad ; achenes 1·5–2·25 mm. long :

8. Achenes strongly longitudinally costate and very slenderly transversely lineolate, not reddish spotted, 1·5–2 mm. long 8. *H. costatum*

8. Achenes sometimes slenderly nerved, not transversely lineolate, reddish spotted :

9. Achenes 2–2·25 mm. long, slenderly few-nerved 6. *H. angolense*

9. Achenes 1·5–2 mm. long, usually smooth, sometimes slightly wrinkled . . . . . 5. *H. heterophyllum*

1. Stems lateral, axillary, or post-phyllary-axillary ; bracts not foliaceous, very small, brownish or greenish-brown ; stem leaves 0 :

10. Leaves 3·5–4 cm. wide . . . . . 14. *H. elatum*

10. Leaves 0·5–2·7 cm. wide :

11. Glumes with apical third pale or whitish :

12. Leaves 1·5–2·7 cm. wide ; corymb 7–12 cm. broad ; upper third of glumes pale with reddish-brown streaks . 11. *H. poecilolepis*

12. Leaves 0·5–1·4 cm. wide ; corymb 0·8–4·5 cm. broad ; upper half of glumes whitish . . . . . 13. *H. senegalense*

11. Glumes with only a narrow pale or whitish margin :

13. Inflorescence corymbiform, 2·5–15 cm. broad ; achenes 2–3 mm. long :

14. Spikes 5–23 mm. long ; achenes ovate to elliptic 10. *H. heteromorphum*

14. Spikes 4–6 mm. long ; achenes oblong-obovate 12. *H. africanum*

13. Inflorescence capitate, 1–3 cm. broad :

15. Leaves 5–15 mm. wide ; spikes 6–12 mm. long ; achenes 3·5–5 mm. long :

16. Leaves 10–15 mm. wide . 16. *H. pynaertii* var. *pynaertii*

16. Leaves 5–8 mm. wide . . . 16. *H. pynaertii* var. *plicatum*

15. Leaves 15–25 mm. wide ; spikes 4–7 mm. long :

17. Leaves 15–17 mm. wide ; spikes 6·5–7 mm. long ; achenes undeveloped . . . . . 17. *H. scaberrimum*

17. Leaves 15–25 mm. wide ; spikes 4–5 mm. long ; achenes 1·5–1·8 mm. long . . . . . 15. *H. rhizomatanthum*

Keys to the Sections of African *Hypolytrum*.

I.

1. Flowering stems several, axillary or post-phyllary-axillary, without foliage leaves ; bracts very small, not foliaceous . . 3. *Scaposae*

1. Flowering stem 1, central, with 1–8 foliage leaves situated well above the base ; bracts foliaceous :

2. Flowering stem arising from the centre of a tuft of foliage leaves or leafless sheaths at or near its base and with 1–4 leaves widely spaced above the base, all linear or oblong and usually lanceolate 2. *Foliigerae*

2. Flowering stem arising from the centre of a few withered cataphylls clothing its base, and with 6–8 foliage leaves, some crowded, some spaced, in its upper part, upper ones oblong-elliptic 1. *Lancifoliae*

II.

1. Stem leaves 6–8, all situated on the upper half, upper ones oblong-elliptic (flowering stem 1, arising from the centre of basal withered cataphylls) . . . . . 1. *Lancifoliae*

1. Stem leaves 0-numerous but only 0–4 situated on the upper half, none oblong-elliptic :

2. Flowering stem 1, arising from the centre of basal or sub-basal foliage, leaves or leafless sheaths, with 1–3 foliage leaves widely spaced above the base ; bracts foliaceous . . . . . 2. *Foliigerae*

2. Flowering stems several, arising from the axils of lower foliage leaves produced on a short shoot, or post-phyllary-axillary, not bearing foliage leaves ; bracts very small, not foliaceous . . 3. *Scaposae*

Sect. 1. **Lancifoliae** *Nelmes*, sect. nov.*

Flowering stem solitary, arising from the centre of a few soon withering cataphylls, which sheathe and clothe its base. *Foliage leaves* 6–10, of medium length, not aggregated at the base but usually confined to the upper two-thirds of the stem, oblong-lanceolate to oblong-elliptic. *Spikes* numerous, borne in corymbiform panicles. *Lower bracts* sub-foliaceous, much exceeding the inflorescence.

Only African species . . . . . 1. *H. lancifolium*

1. **Hypolytrum lancifolium** *C. B. Clarke* in Dyer, Fl. Trop. Afr. 8 : 488 (1902).—French Cameroons, *Bates* 308.

Rhizome rather slender. *Stem* distinctly trigonous, 95–145 cm. tall, 4–6 mm. thick below, smooth below the often more or less scabrid rhachis. *Leaves* widely spaced below and above but often 2–3 arising close together at about the centre of the leaf-bearing area, lower much exceeded by, upper usually much exceeding, the flowering stem, 2–4·5 cm. wide, lower longly upper rather shortly sheathing. *Inflorescence* 2·5–5 cm. long and 4–12 cm. broad. *Spikes* rather numerous, shortly cylindric in flower, the lower part becoming stouter in fruit, upper part often failing to develop fruits, 6–10 mm. long. *Glumes* 2–2·75 mm. long, dark reddish-brown or lighter brown with darker streaks, margins pale and thinner. *Achenes* ovate to elliptic, biconvex, about 2 mm. long, 1–1·4 mm. broad, more or less the lower half costate, costate-wrinkled, or wrinkled, shining, olive-brown to dark-brown, smooth above but minutely puncticulate and stramineous, sometimes splashed brown, sometimes with a small beak.

French Cameroons : Efulen, 2 July 1895, *Bates* 308 (K) ; Bipinde, primitive forest, 1911, *Zenker* 4178 (BM,K) ; ibid., 1913, *Zenker* 4871 (BM, BR, K) ; Lolodorf, Ngorvayang Mtn., 600 m., forest, 13 June 1918, *Annet* 217 (P).

Gabon : Mambanza, 14 Sept. 1932, *Le Testu* 8892 (LeT) ; banks of the Lara and the Okano, 23–25 Oct. 1933, *Le Testu* 9334 (B, K, P, LeT) ; at the foot of the rocks of Mengong, Nzec, 9 Nov. 1933, *Le Testu* 9284 (LeT).

Cabinda : Mayombe ; in shady forest on the banks of the river N'Zanza, on the M'Bulu Hills, 29 Jan., 1919, *Gossweiler* 7763 (BM, K).

This species, with its concentration of leaves above the middle point of the stem, and its basal cataphylls in place of the usual aggregation of leaves, has a clearly distinctive facies.

* Sect. **Lancifoliae** *Nelmes*, sect. nov.—Ab congeneribus culmo centrali superne folioso inferne vaginis aphyllis emarcidis exceptis nudo, foliis oblongo-lanceolatis vel oblongo-ellipticis distincta.

Sect. 2. **Foliigerae** *C. B. Clarke*
in Dyer, Fl. Trop. Afr. 8 : 486 (1902).

Flowering stem solitary, arising from the centre of a tuft of foliage leaves, or, less commonly, leafless sheaths. *Foliage leaves* mostly basal and sub-basal but 0–4 spaced apart higher on the stem, linear-lanceolate to oblong-lanceolate. *Spikes* numerous or very numerous, borne in corymbiform panicles. *Lower bracts* foliaceous or subfoliaceous, exceeding the inflorescence.

Lower bracts subfoliaceous and, with the upper stem leaves, only slightly overtopping the inflorescence ; glumes sometimes acuminate above, apex acute to obtuse, 3–4·5 mm. long . 9. *H. cacuminum*

Lower bracts foliaceous and, with the upper stem leaves, far overtopping the inflorescence ; glumes not acuminate, apex rounded, 2–3·25 mm. long :

Leaves 2·5–4 cm. wide ; spikes 8–12 mm. long ; glumes mottled 2. *H. polystachyum*

Leaves 0·8–3·5 cm. wide ; glumes not mottled :

Spikes 9–12 mm. long ; achenes wholly wrinkled . 3. *H. chevalieri*

Spikes 3–8 mm. long ; achenes not wrinkled above :

Achenes slightly constricted above the middle . . . . 7. *H. testui*

Achenes not constricted :

Leaves 1·3–3·5 cm. wide ; inflorescence 3–20 cm. broad ; achenes 2–2·5 mm. long, reddish-spotted . . . 4. *H. purpurascens*

Leaves 0·8–1·7 cm. wide ; inflorescence 3–6 cm. broad ; achenes 1·5–2·25 mm. long :

Achenes strongly longitudinally costate and very slenderly transversely lineolate, not reddish-spotted, 1·5–2 mm. long. 8. *H. costatum*

Achenes sometimes slenderly nerved, not transversely lineolate, reddish-spotted :

Achenes 2–2·25 mm. long, slenderly few-nerved . 6. *H. angolense*

Achenes 1·5–2 mm. long, usually smooth, sometimes slightly wrinkled . . . . . 5. *H. heterophyllum*

2. **Hypolytrum polystachyum** *Cherm.* in Bull. Soc. Bot. France, 80 : 507 (1933).—Gabon, *Le Testu* 8708.

Rhizome and lower part of *stem* absent. *Stem* present trigonous, up to more probably much more than 150 cm. tall and up to 6 mm. thick, smooth except for the rough apex and rhachis. *Leaves* probably mostly basal and sub-basal, but 1–3 spaced on the portion of stem present and much exceeding the inflorescence, 2·5–4 cm. wide, flat, longly sheathing

the stem. *Inflorescence* 15–18 cm. long, 14–20 cm. broad. *Spikes* very numerous, ellipsoid-cylindric or lanceoloid and 8–12 mm. long in flower. *Glumes* about 3 mm. long, margins thinner, lower third pale, middle third brownish becoming darker brown upwards then suddenly pale in the upper third, giving a mottled appearance to the spikes. *Achenes* quite undeveloped.

Gabon : Haut-Ogooué ; Malendé, 29 March 1931, *Le Testu* 8708 (LeT).

I have not seen *H. polystachyum* Cherm. var. *depauperatum* Cherm. l.c.— Middle Congo ; banks of the Congo, 1883, *Thollon* 45.

The inflorescence of this species bears a striking resemblance to Madagascar specimens at Kew annotated " *H. testaceum* and *H. madagascariense* " by C. B. Clarke, especially in the mottled appearance of the spikes.

3. **Hypolytrum chevalieri** *Nelmes* ; species nova, ab omnibus congeneribus praesertim apice achaenii et basi styli latissimis distincta.— Gabon : *Chevalier* 26987.

Rhizome and lower part of *stem* absent. Upper part of *stem*, including inflorescence, about 64 cm. tall, trigonous, 3 mm. thick below, smooth except slightly rough at the apex and very scabrid on the rhachis, probably arising centrally from a tuft of basal foliage leaves. These basal *leaves* absent, but 2, widely spaced, present on the upper part of the stem, much exceeding the inflorescence, 2·2 2·4 cm. wide, longly sheathing. *Inflorescence* 8–12 cm. long and about 13 cm. broad. *Spikes* numerous, more or less shortly cylindric in flower, often becoming lanceoloid or oblanceoloid in fruit, 9–12 mm. long. *Glumes* more or less 3 mm. long, margins thinner, castaneous. *Achenes* usually obovate but sometimes elliptic or suborbicular (or subglobose when extremely biconvex), strongly biconvex, 1–1·5 mm. long, including the broad, flattened base of the style—or apex of achene, all about 1 mm. broad, strongly wrinkled, reddish-brown, apex (or base of style) sulcate, paler, tapering below and often very shortly and conically stipitate. *Style* long and slender, gradually expanding into a very wide, flattened base which is apparently merged into the achene.

Gabon : Plantation Stéphana, on the Bokoué, 9 Oct. 1912, *Chevalier* 26987 (P).

4. **Hypolytrum purpurascens** *Cherm.* in Bull. Soc. Bot. France, 80 : 508 (1933).—Gabon, *Le Testu* 8717.

Stem distinctly trigonous, 60–150 cm. tall, 2–6 mm. thick, smooth from base to apex where the angles are usually scabrid as are those of the rhachis. *Leaves* rather numerous, mostly basal and sub-basal but 1–3 widely spaced up the stem, mostly exceeding to very much exceeding the stem, 1·3–3·5 cm. wide, sometimes purplish spotted, stem leaves mostly with long sheaths, basal ones with short split-fronted (open) sheaths, often reduced to brownish, purplish, or vinaceous cataphylls. *Inflorescence* 4–15 cm. long and 3–20 cm. broad. *Spikes* numerous, ellipsoid, oblong-ellipsoid, or fusiform in flower, ovoid, obovoid to globose in fruit, 4–10 mm. long. *Glumes* 2·25–3 mm. long, light castane-

ous with darker streaks, thinner on the margins. *Achenes* elliptic to obovate, biconvex, 2–2·5 mm. long, 1–1·3 mm. broad, stramineous but thickly covered with dark reddish depressed spots, with obscure or slender longitudinal raised lines, or sometimes slightly wrinkled below, apex tapering to rounded, often shortly beaked, base more or less tapering.

Sierra Leone : Mano Salija, edge of marsh, 29 Nov. 1926. *Deighton* 340 (K) ; inland swamp near Topan (Kwako Krim), Feb. 1930, *Roadon* 6, 7 (K) ; Kamba, on Mange–Kambia road, edge of stream, very uncommon, 15 March 1932, *Glanville* 413 (K) ; near Njala, marsh, 21 Nov. 1932, *Deighton* 2561 (K) ; Gbap, in swamp covered with high bush, occasional, 14 March 1946, *Adames* 17 (K).

Liberia : Montserrado Co. ; Monrovia, Duport, wet primitive forest, Innk River, common, 19 May 1929, *Dinklage* 3052 (B) ; by stream 5 miles east of Monrovia, 5 June 1947, *Baldwin* 5907 (K, US) ; Marshall, 8 Feb. 1948, *Baldwin* 11047 (K, NY, US). Boporo District : near Loffa River, about 15 miles from Kondessu, 15 Dec. 1947, *Baldwin* 10659 (K) ; Piatah, robust plant of swamp, 7 Oct. 1926, *Linder* 948 (K). Grand Bassa Co. ; Buchanan, 4 March 1948, *Baldwin* 11201 (K, MO, NY, US). Sinoe Co. ; Sangwin, 8 March 1948, *Baldwin* 11255 (K, US) ; Sinoe Basin, 1904, *Whyte* (K). Gbarnga District ; in mud at edge of stream in original forest, 23 Sept. 1926, *Linder* 797 (K). Salala District ; within radius of 20 miles of Kakatown, *Whyte* (K). Sanokwele District : Ganta, 25 March 1936, *Harley* 898 (K) ; ibid., edge of swamp, 25 Jan. 1946, *Harley* 1377 ; edge of swamp, 5 Jan. 1951, *Harley* 1730 (K).

Ivory Coast : virgin forest between the mid-Sassandra and the mid-Cavally, 27 June–2 July 1907, *Chevalier* 19215 (P) ; basin of the Cavally, seashore between Tabon and Beriby, 16–17 Aug. 1907, *Chevalier* 19955 (P) ; Mt. Orumbo-Boka, near Toumodi, 15 Dec. 1953, *Boughey* All (Gold Coast Herb. 14426) (K).

Nigeria : West Province ; dry zone, *Kitson* 1908 (BM). S. Nigeria : Lagos, Feb. 1895, *Millen* 193 (K) ; ibid., Ikoyi Plains, in swamp forest, 26 Jan. 1917, *Dalziel* 1304 (K) ; ibid., Sapoba 1931, *Kennedy* 1914 (K) : Cameroons Province ; Mamfe District, shores of Lake Ejagham in Kembong F.R. High Forest, on the path leading from the Calabar–Manfe road to Lake Ejagham, 17 March 1953, *Onochie* FHI 30899 (K) ; Benin Province and District : Sapoba, Jamieson River, clear deep stream, in mud by water's edge, 25 Feb. 1953, *Onochie* FHI 31939 (K) ; Eket District : along the rivers, 1912–13, *Talbot* 3063 (BM).

British Cameroons : Rio del Rey, comm. June 1887, *Johnston* (K).

Fernando Po : in turf, Nov. 1841, *Vogel* 206 (K) ; in swampy places, Dec. 1859, *Mann* 120 (K).

French Cameroons : Batanga ; Lobe River, above waterfall, shady damp ground near water's edge, 8 April 1895, *Bates* 149 (K).

Spanish Guinea : Mt. John, Kongue River, Sept. 1862, *Mann* 1894 (K).

Gabon : Nkogo environs, on the Ogooué, 15 Aug. 1912, *Fleury* in *Chevalier* 26356, 26356 bis (P) ; Haut-Ogooué : summit of the Badicosslou rocks, 31 March 1931, *Le Testu* 8717 (P) ; Echiras Forest, bank

of a stream, Guidoumacets-Sainte-Croix, 20 Nov. 1924, *Le Testu* 5087 (LeT) ; banks of the Agooué, Lastoursville, 13 March 1929, *Le Testu* 7034 (LeT).

French Congo : Mayombe ; 20–30 Jan. 1904, *Chevalier* 11280 (K, P).

Cabinda : Pango Monga ; here and there in boggy places, 23 Dec. 1915, *Gossweiler* 6022 (BM, K).

Belgian Congo : Moanda, 11 and 12 Nov. 1930, *Vanderyst* 27514 (BR), 27518 (BR).

Angola : Peco stream of the Congo, 27 Dec. 1921, *Gossweiler* 8549 (BM).

The combination *H. nemorum* Beauv., Fl. Owar. 2 : 13, t. 67 (1810) was based on *Schoenus nemorum* Vahl. Symb. Bot. 3 : 8 (1794) which is an Indian plant, but Beauvais was describing the above-described African species of *Hypolytrum*, which is distinct from the Indian. This Indian plant is very probably that known as *H. wightianum* Boeck. which therefore becomes *H. nemorum* (Vahl) Beauv.

H. purpurascens Cherm. was intended by its author to apply to what he considered to be a new species, but which in my opinion is a specimen of the plant so long known as " H. nemorum Beauv." so that Chermezon's epithet seems unintentionally to be the correct one for this common and well known species.

In Hutchinson & Dalziel's Flora of West Tropical Africa, 2 : 472, 473 [fig. 344] (1936), this species is identified as *heterophyllum* Boeck., which from its description I am inclined to think is an allied species.

5. **Hypolytrum heterophyllum** *Boeck.*, Cyper. Nov. 1 : 22 (1888).—Cameroons, *Buchholz*.

Hypolytrum buchholzianum Boeck. l.c.—Cameroons, *Buchholz*.

H. congense C. B. Clarke ex De Wild. et Th. Dur. in Bull. Soc. Bot. Belg. 38 : 115 (1900)—Belgian Congo, *Dewèvre* 746).

H. nemorum Spreng. var. *minus* Cherm. in Bull. Soc. Bot. France, 77 : 276 (1930)—Gabon, *Le Testu* 5014.

Stems distinctly trigonous, 35–45 (60) cm. tall, 2–3(4) mm. thick, smooth except for roughish angles at apex and on the rhachis. *Leaves* rather numerous, mostly basal and sub-basal but 2–3 spaced throughout the stem, these and most of the basal ones longer to much longer than the stems, 8–12(17) mm. wide, stem leaves sheathing the stem, lower basal ones reduced to nearly bladeless open sheaths. *Inflorescence* 2–4(6) cm. long and 3–4(6) cm. broad. *Spikes* rather numerous to numerous, more or less ellipsoid in flower, ovoid to globose in fruit, 3·5–5 mm. long. *Glumes* 2–2·25 mm. long, margins thinner, castaneous with darker streaks. *Achenes* ovate, obovate, or broadly elliptic, strongly biconvex, often turgid-tetragonous below, 1·5–2 mm. long, 1–1·3 mm. broad, densely reddish-brown or with large reddish spots or patches, sometimes slightly wrinkled, shining, sulcate, tapering above the middle into a short beak, less tapering below to a broad, rounded base.

Cameroons : Abo, *Buchholz*.

Gabon : environs of Adouma, on the Orimbo, tributary of the Ogooué, in the forest, 25 July 1912, *Fleury* in *Chevalier* 26166 (P) ; environs of Lambaréné, on the Ogooué, 2 Aug. 1912, *Fleury* in *Chevalier* 26270 (P) ; village of Ebimangh, on the edge of Lake Ayem, 23 Aug. 1912, *Fleury* in *Chevalier* 26426, 26427 (P) ; Haute Ngounyé, Mouila, edge of a water-hole in the savannah, 20 Oct. 1924, *Le Testu* 5014 (B, BR, K, P).

Belgian Congo : sandy places on the banks of the Congo near Lukolela, 1896 and on the banks of the Kassuku, 2 Nov. 1896, *Dewèvre* 746 (BR) ; 1061 bis (BR) ; Stanley Pool, June 1899, *Schlechter* 12583 (BM, BR, K) ; Eala, 1 Feb. 1907, *Pynaert* 1016 (BR) ; Eala, 5 Aug. 1907, *Pynaert* 1639 (BR) ; environs of Coquilhatville, savannah of the equatorial region, 13 Aug. 1912, *Chevalier* 27963 (P) ; Wombali, Aug. 1913, *Vanderyst* 1987 (BR, K) ; Bandunda, Nov. 1914, *Vanderyst* 5169 (BR, K) ; Boma, June–July 1915, *Vanderyst* & *Lambrette* 5508 (BR) ; Gobari river, July 1917, *Vanderyst* (BR) ; Bafwaboli, March 1921, *Claessens* 324 (BR, K) ; Ipamu, June 1921, *Vanderyst* 9517 (BR) ; Kwango 1925, *Vanderyst* 16140 (BR) ; environs of Coquilhatville, forest strip by the Ruki river, June 1930, *Lebrun* 574 (BR, K) ; Eala, marshy places, Nov. 1930, *Staner* 1389 (BR, K); Kisantu, 1933, *Vanderyst* 34544 (BR) ; Boteke, Sept. 1935, *Louis* 95 (BR) ; between Eala and Bantoie, path on edge of forest periodically flooded, July 1936, *Coûteaux* 38 (BR) ; Great Bassao Island, a little downstream from Lilèke, primitive forest, 470 m., 26 Jan. 1939 *Louis* 13419 (BR) ; Coquilhatville, confluence of the Ikelemba, Feb. 1949, *Germain* 4778 (YBI) ; Yasendu, environs of Isangi, 1 May 1949, *Germain* 4889 (YBI) ; Ikela (Tshuapa), Jan. 1952, *Germain* 7353 (YBI).

I have not seen *H. nemorum* Spreng. var. *micranthum* Cherm. l.c. 77 : 507 (1930), which was based on the two following gatherings : (1) *Thollon* 344, Gabon, banks of the Ogooué, Dec. 1883, and (2) *Schlechter* 12583, Congo, Stanley Pool, June 1899.

6. **Hypolytrum angolense** *Nelmes* ; species nova, a *H. heterophyllo* Boeck. culmis altioribus achaeniis majoribus longitudinaliter plurinerviis praecipue distinguenda.—Angola, *Milne-Redhead* 4096.

Stems distinctly trigonous, 90–95 cm. tall, 4–5 mm. thick below, smooth but scabrid on the angles of the rhachis. *Leaves* rather few, basal, and 2 widely spaced on the stem, mostly much longer than the stem, 13–16 mm. wide, stem leaves longly sheathing, others open with thin membranous margins. *Inflorescence* 5–7 cm. long and 5·5–6 cm. broad. *Spikes* numerous, ellipsoid, ovoid or subglobose in fruit, 4–6·5 mm. long. *Glumes* 2–2·5 mm. long, pale with reddish-brown streaks, and with a dark brown median band, upper margins thinner. *Achenes* obovate, biconvex, 2–2·25 mm. long, 1–1·5 mm. broad, faintly to distinctly few-nerved longitudinally, some of the nerves often slightly wrinkled, thickly covered with small reddish spots, tapering above the middle, less tapering below.

Angola : District of Moxico ; east of Lusavo Falls on bank of stream, in dense clump of evergreen vegetation, 13 Jan. 1938, *Milne-Redhead* 4096 (BR, K) ; Dundo, north-east of Lunda, near the river Luachima, shade of gallery woods of Pluviilignosa, 750 m., 27 Nov. 1946, *Gossweiler* 13882 (B, K).

7. **Hypolytrum testui** *Cherm.* in Bull. Soc. Bot. France, 77 : 277 (1930).—Gabon, *Le Testu* 6512.

Stems distinctly trigonous, 30–150 cm. tall, 1·25–5·5 mm. thick, smooth below, ferrugineously rough and scabrid above, especially at the apex and on the rhachis. *Leaves* rather numerous or numerous, mostly basal and sub-basal but 1–3 widely spaced on the stem above, shorter to much longer than the stem, 1–3 cm. wide, flat or flattish but conduplicate at the base, apices acuminate, scarcely attenuate, stem leaves longly sheathing. *Inflorescence* 3·5–15 cm. long and broad. *Spikes* numerous or very numerous, ellipsoid or obovoid-ellipsoid in flower, ovoid to subglobose in fruit, 4–7 mm. long. *Glumes* 2–3 mm. long, light brown with sometimes darker flecks to dark ferrugineous. *Achenes* more or less elliptic and biconvex or obovate and biconvex only in the lower two-thirds, then usually a constriction, above which is a narrower oblong part with a rounded apex, or oblong-ovate and compressed-biconvex, 2·2–2·5 mm. long, 1–1·5 mm. broad, lower part slenderly or strongly costate-wrinkled and pale to brownish, sometimes covered with small reddish dots, upper part smooth but slightly sulcate and minutely puncticulate and pale, sometimes flushed reddish-brown. There follows a selection of specimens.

Gabon : Lipuizamoy, 23 June 1927, *Le Testu* 6512 (P) ; Mangoungoulau waterfall on Mt. Iboundji near Banguiele, 30 Dec. 1930, *Le Testu* 8647 (LeT) ; Mania, 12 June 1931, *Le Testu* 8854 (LeT) ; Bacwaca, 9 Oct. 1932, *Le Testu* 8943 (LeT).

Cabinda : Mayombe ; banks of Luali river, frequent near official residence at Belize, 16 Nov. 1918, *Gossweiler* 7551 (BM, K) ; ibid., Oct.–Nov. 1921, *Dawe* 275 (K).

Belgian Congo : Stanley Pool, banks of a stream in the dry season, 23 Sept. 1898, *Duchesne* 27 (BR) ; Walikale Lubutu, forest margin, 20 Jan., 1915, *Bequaert* 6676 (BR) ; Katala, Nambi, wooded banks of the Congo, 28 June 1915, *Bequaert* 7902 (BR) ; Urega, swamp in forest 820 m., July 1932, *Lebrun* 5706 (BR, K) ; between Katako Kombe and Lodja (Lake Leopold II), forest strip, river bed, Sept. 1932, *Lebrun* 6208 (BR) ; 5 km. south of Yambuya, bank of river Kwongwola, in undergrowth in primitive forest, only one plant found, +500 m., 24 Jan. 1938, *Louis* 7664 (BR) ; Yalulia, at 20 km. east of Yangambi ; bank of river Butale, primitive forest, in tufts, ± 470 m., 30 May 1938, *Louis* 9559 (BR) ; north of N. Gazi in under-growth in primitive forest on the river Lomoma ± 470 m., 16 Feb. 1939, *Louis* 13684 (BR) ; Yangambi, Djombosoke, raised mud-bank, 23 Oct. 1947, *Leonard* 1508 (BR).

Tanganyika : Tanga Province ; Lushoto District ; Nquelo, primitive forest, Feb. 1893, *Holst* 2288 (K) ; Pongwe, Nov. 1905, *Braun* 1062 (EA) ; Amani, primitive forest, damp place, 1000 m., 12 July 1913, *Grote* 5239 (EA, K) ; Bomole Mtn., near Amani, primitive forest, 1000 m., 9 Jan. 1914, *Peter* 188 (B) ; Derema to Ngambo, primitive forest, 870 m., 4 Aug. 1915, *Peter* 12495 (B) ; Sangerowe, evergreen rain-forest, scattered clumps, not very common, 930 m., 31 July 1929, *Greenway* 1664 (EA, K) ; Amani, Kwamkoro, evergreen rain-forest, 930 m., 25 Jan. 1933, *Greenway* 3344 (EA) ; Amani, sloped clearing in *Piptadenia–Cephalosphaera Allanblackia* rain-forest, 900 m., 11 March 1950, *Verdcourt* 103 (K) ; Lushoto District ; Mderema road, E. Usambaras, 900 m.

field layer of rain forest, 23 Aug. 1953, *Drummond* & *Hemsley* 3426 (K). Eastern Province ; Morogoro District ; Uluguru Mtns., north-west slope, mist-forest, open places, 1320 m., 25 Jan. 1933, *Schlieben* 3294 (BM, BR) ; Ulanga District ; Muhulu Mts., S.S.W. of Mahenge, commonly in groups, mist-forest, 1200 m., 24 Feb. 1932, *Schlieben* 1826 (B, BM, BR) ; Tanga District ; Mlinga Peak, E. Usambaras, 1000 m. field layer of forest, 7 March 1953, *Drummond* & *Hemsley* 1447 (K).

8. **Hypolytrum costatum** *Nelmes* ; species nova, ab omnibus congeneribus praesertim achaeniis longitudinaliter valde 2–4-nervosis et transverse tenuiter lineolatis distinguenda.—Liberia, *Baldwin* 6072.

Stem trigonous, 56 cm. tall, 1·5–2 mm. thick below, smooth except for scabrid angles on the rhachis. *Leaves* several, spaced apart on the stem but more frequent towards tha apex, lower in the form of almost leafless sheaths, mostly shorter but few upper longer than the stem, 1–1·5 cm. wide, longly to shortly sheathing. *Inflorescence* 6 cm. long, 4·5 cm. broad. *Spikes* 20–30, lanceoloid, ellipsoid, or cylindric, 5–8 mm. long. *Glumes* 2 ·2·5 mm. long, margins thinner, dull castaneous with darker streaks. *Achenes* obovate to broadly elliptic, strongly biconvex or turgid, 1·5 ·2 mm. long, about 1 mm. broad, with 2–4 longitudinal strongly raised lines on each face, and densely transversely very finely lineolate between them, shining dark reddish.

Liberia : Webo District, Nyaake (Webo), top of Pah Mtn., 21 June 1947, *Baldwin* 6072 (K, MO, NY).

This plant is remarkable for the surface markings of its achene wholly unlike those of any other species.

9. **Hypolytrum cacuminum** *Nelmes* ; species nova, ab omnibus congeneribus praesertim bracteis, inferioribus subfoliaceis glumis interdum acuminatis 3–4·5 mm. longis distinguenda.—Sierra Leone, *Jaeger* 769.

Stems trigonous, 65–125 cm. tall, 3–6 mm. thick, smooth below and sometimes above, angles usually somewhat scabrid towards the apex and on the rhachis. *Leaves* numerous, basal and sub-basal and 2 4 widely spaced on the stem above, lower ones shorter than or equalling upper exceeding the stem, about 1–1·7 cm. wide, usually weakly to strongly plicate, margins often more or less revolute, stem leaves longly sheathing. *Inflorescence* 5–6 cm. long and 6–7 cm. broad. *Spikes* numerous, mostly ellipsoid, 5–7 mm. long. *Glumes* 3–4·5 mm. long, apical margin pale and tending to fray, ferrugineous to spadiceous, paler at the base. *Achene* (only 1 mature) elliptic, biconvex, about 2 mm. long and 1 mm. broad, lower half slenderly nerved-wrinkled and light reddish-brown covered with darker spots, upper half scarcely nerved, smooth but minutely puncticulate, slightly reddish-brown spotted below.

Sierra Leone : Loma Mts., summit of the Da-Oulen with *Dissotis leonensis*, Nov. 1944, *Jaeger* 685 (K) ; prairie of the summit of the Little Sérélen-Konko, 22 Nov. 1944, *Jaeger* 769 (K) ; savannah of the summit of the Da-Oulen, 31 Aug. 1945, *Jaeger* 1326 (K), *Jaeger* 1339 (K) ; high savannah of the Sérélen-Konko, ± 1500 m., 5 Sept. 1945, *Jaeger* 1440 (K).

Liberia : Vonjama District ; near summit of Mt. Wolagwisi near Pandamai, forest, 2 March 1944, *Bequaert* 94 (AA, K).

Sect. 3. **Scaposae** *C. B. Clarke*
in Dyer, Fl. Trop. Afr. 8 : 487 (1902).

Flowering stems several, arising from the axils of lower foliage leaves produced on a short shoot, or post-phyllary-axillary, not bearing foliage leaves. *Foliage leaves* closely situated on a short or shortish shoot which does not develop into a flowering stem, linear-lanceolate to oblong-lanceolate. *Spikes* few to numerous, borne in corymbiform panicles or sometimes sessile in dense heads. *Bracts* very small, not foliaceous.

Leaves 3·5–4 cm. wide . . . . . 14. *H. elatum*

Leaves 0·5–2·7 cm. wide :
Glumes with the apical third pale or whitish :
Leaves 15–27 mm. wide ; corymb 7–12 cm. broad ; upper third of glumes pale with reddish-brown streaks . 11. *H. poecilolepis*

Leaves 5–14 mm. wide ; corymb 0·8–4·5 cm. broad ; upper half of glumes whitish . . . . . 13. *H. senegalense*

Glumes with only a narrow pale or whitish margin :
Inflorescence corymbiform, 2·5–15 cm. broad ; achenes 2–3 mm. long :
Spikes 5–23 mm. long ; achenes ovate to elliptic 10. *H. heteromorphum*
Spikes 4–6 mm. long ; achenes oblong-ovate . . 12. *H. africanum*

Inflorescence capitate, 1–3 cm. broad :
Leaves 5–15 mm. wide ; spikes 6–12 mm. long ; achenes 3·5–5 mm. long :
Leaves 10–15 mm. wide . . . . 16. *H. pynaertii* var. *pynaertii*

Leaves 5–8 mm. wide . . . . 16. *H. pynaertii* var. *plicatum*

Leaves 15–25 mm. wide ; spikes 4–7 mm. long :
Leaves 15–17 mm. wide ; spikes 6·5–7 mm. long ; achenes undeveloped . . . . . 17. *H. scaberrimum*

Leaves 15–25 mm. wide ; spikes 4–5 mm. long ; achenes 1·5–1·8 mm. long . . . . . 15. *H. rhizomatanthum*

10. **Hypolytrum heteromorphum** *Nelmes* in Kew Bull. 1955 : 522 (1955).—Tanganyika, *Watkins* 526.

Stems arising from the axils of the lower of leaves crowded on a short shoot or sometimes post-phyllary-axillary, 15 80 cm. tall, 0·5–3 mm. thick below, usually complanate but sometimes compressed-trigonous, smooth below, rough towards the apex, sometimes purplish at the base which is clothed with brownish or vinaceous sheathing scales. *Leaves* numerous, longer, usually very much longer than the stems, 7 20 mm.

wide, with a rigid, conduplicate basal part, slenderly septate-nodulose, base with a split sheath leaving membranous, vinaceous margins. *Inflorescence* a terminal more or less corymbiform panicle, 2–6 cm. long and 2·5–7 cm. broad. *Bracts* mostly brown or brownish, sometimes lower green or greenish, shorter to much shorter than their partial inflorescences (clusters). *Spikes* few to rather numerous, upper part of spike, up to more than half its length, usually failing to develop fruits, sometimes whole spike fructiferous, slenderly cylindric in flower, the fertile part becoming more stoutly cylindric or lanceoloid in fruit, 5–23 mm. long. *Glumes* 2·25–2·75 mm. long, narrowly thinner on the margins, ferrugineous to castaneous. *Achenes* ovate or elliptic, biconvex below, compressed-biconvex above, 2·3 mm. long, 1·2–1·5 mm. broad, lower half to two-thirds obscurely to strongly longitudinally straight-costate and often wrinkled-costate and light to dark brown, upper part often with a basal rather slight transverse constriction, smooth but minutely puncticulate, pale to light brownish.

French Guinea : Sulimania, near Erimakuna, Falaba, 29 March 1892, *Scott Elliot* 5396 (BM, K).

Sierra Leone : Benna Sangosanga, dense shade, 13 Jan. 1892, *Scott Elliot* 4415 (BM, K) ; Makonde (Limba) 14 April 1892, *Scott Elliot* 5686 (BM, K) ; Kamabai, ± 135 m., 17 May 1914, *Thomas* 345 (K) ; without precise locality, 1915, *Thomas* 9901, 10499 (K) ; Ndilajula, near Njala, shade, 12 Feb. 1928, *Deighton* 1078 (BM, K) ; shady place, Njala, 27 Feb. 1928, *Deighton* 1091 (BM) ; near Mange Bure on sandy banks in river channel now dry, viviparous, 5 Jan. 1953, Jordan 850 (K).

Liberia : Grand Cape Mount Co. ; Cape Mount, Nabenah, primeval forest on the bank of a river tributary, foot of Mafa on loamy soil, 20 m., 9 April 1909, *Dinklage* 2584 (B) ; Sanokwele District ; Ganta, 15 Dec. 1935, *Harley* 796 (K), ? ibid., Bilimu (Bobei) Mtn., shaded rocky hillside, 2 Jan. 1944, *Harley* 1327 (K) ; ibid., Ganta, in forest, 26 Jan. 1950, *Baldwin* 14050 (K) ; Sinoe Co., Sinoe Basin, 1904, *Whyte* (K).

Ivory Coast : Agbo station, 3 Jan. 1907, *Chevalier* 16611 (P) ; valley of the Agnieby, Mbago, 2 Feb. 1907, *Chevalier* 17121 (P) ; Prov. de Attié, Alepé, in a marsh, 26–28 Feb.-1–3 March, 1907, *Chevalier* 17363 (P).

Gold Coast : Agboko to Dedesu, Afram Plains, on river flat in fairly thick bush, 10 May 1928, *Kitson* 1125 (K) (depauperate state).

Nigeria : Onitsha on the Lower Niger, *Barter* 1575 (K) ; Oban 1911 and 1912, *Talbot* 857 and 2401 (BM, K) ; Ogoja Province, Ikom District, cross river Mfum ferry on Ikom–Mamfe road, on sandstone cliff, very wet, beneath high forest, by small tributary stream, 31 Dec. 1950, *Keay* (FHI 28312) (K).

French Cameroons : Batanga, shaded river bank, Lobe River, above waterfall, 8 April 1895, *Bates* 148 (BR, K) ; Bipinde, virgin forest, 1899, *Zenker* 2052 (B, BM, K) ; ibid., 1912 *Zenker* 4655 (B, BM, BR, K).

Sao Thomé : Angolares at Agua Gombela, 50 m., Jan. 1886, *Quintas* 12 (BM, COI) = Fl. Afr. Exsicc. 127 (COI, K).

Principe : Oque Pipi, ± 300 m., in secondary forest near a stream, 6 Dec. 1932, *Exell* 497 (BM).

Gabon : banks of the Mboumi at Mbigou, 18 Nov. 1925, *Le Testu* 5764 (LeT) ; Dwan, 22 March 1933, *Le Testu* 9047 (B, K, LeT).

Cabinda : Mayumbe, in shady and humid places at Pango Monga, 9 Feb. 1916, *Gossweiler* 6247 (BM).

Belgian Congo : (a selection) : Boumba, among under-growth, June 1891, *Demeuse* 412 (BR) ; Kisantu, *Gillet* 1900 (BR) ; Kwango, July 1913, *Vanderyst* 1429 (BR) ; down stream from Panga, marsh on stream-bank, 15 Dec. 1913, *Bequaert* 1491 (BR) ; Penghe, shady forest on the banks of the Ituri, 4 Feb. 1914, *Bequaert* 2295 (BR) ; Womboli, Oct. 1951, *Vanderyst* 2447 (BR) ; between Bumba and Basoko, in forest on river banks, very common, April 1921, *Goossens* 2497 (BR) ; between Stanleyville and Buta, steep bank of the river Tele, 14 April 1936, *Louis* 1658 (BR) ; Yangambi, on the bank of the river Congo, among under-growth of primitive forest, ± 470 m., 23 Feb. 1938, *Louis* 8003 (BR) ; Yangambi, Esali Island, among under-wood of primitive lianous forest, sometimes inundated in the interior of the island, ± 470 m., 23 July 1938, *Louis* 10463 (BR) ; Yangambi, marshy under-forest of the Longunguna, ± 470 m., 21 Feb. 1939, *Louis* 13763 (BR) ; Yangambi, Jan. 1953, *Germain* 8181 (YBI).

Uganda : Masaka District ; Sese Islands, Bugala Island, Toa, 2 March 1933, *Thomas* 929 (K) ; Malabigambo forest, 4 miles S.S.W. of Katera, 1150 m., field layer of swamp forest, 2 Oct. 1953, *Drummond & Hemsley* 4563 (K). Mengo District ; Semunya Forest, about 8 miles N.W. of Entebbe, 16 June 1950, *Dawkins* 598 (K).

Tanganyika : Bukoba District ; Kikuru Forest, Reserve, forming forest ground cover, 16 Sept. 1934, *Gillman* 157 (K) ; ibid., Mingiro Forest Reserve, in the wetter depressions in this dense semi-swamp evergreen forest, Sept. 1950, *Watkins* 526 (F.H.3265) (EA, K).

This species was misidentified by C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 488 (1902) as *H. africanum* Nees ex Steud., a naming which was widely accepted during the ensuing half-century.

11. **Hypolytrum poecilolepis** *Nelmes* ; species nova, a *H. heteromorpha* Nelmes spicis brevioribus glumis superne pallidissimis (glumis poecilolepis) distinguenda.—Sierra Leone, *Lane-Poole* 143.

Stems 30–50 cm. tall, 1–2 mm. thick, distinctly trigonous, often fuscous or purplish, smooth below or only at the base, rough to very rough above, including the rhachis, clothed in the basal area with semi-sheathing, brown or ferrugineous, scales or bladeless sheaths. *Leaves* rather numerous, from about equalling to much longer than the stems, 1·5–2·7 cm. wide, with a rather short conduplicate basal part, often slenderly septate-nodulose in places ; *sheaths* open, with brown margins. *Inflorescence* a terminal corymbiform panicle, 3–6 cm. long and 7–12 cm. broad. *Bracts* purplish-brown to ferrugineous, usually shorter to much shorter than their partial panicles. *Spikes* numerous, ellipsoid, fusiform, or cylindric-ellipsoid, 4–9 mm. long. *Glumes* 2·5–3 mm. long, apical third or less very pale with reddish-brown streaks, centre third fuscous-brown, base light brown, giving a mottled appearance to the spikes, margins pale and thinner. *Achenes* ovate to elliptic or oblong-elliptic, biconvex, 2–2·5 mm. long, 1·4–1·6 mm. broad, lower half strongly wrinkled and

olive-green to dark brown, upper part smooth but minutely puncticulate and stramineous.

Sierra Leone : [without precise locality], recd. 20 Aug. 1907, *Smythe* 123 (K) ; [without precise locality], recd. 24 March 1914, *Lane-Poole* 143 (K) ; Ken(n)ema, 20 Jan. 1914 [? 1915], *Thomas* 7566 (K) ; Kambui Hills, 26 Feb. 1918, *Aylmer* 219 (K) ; Gorahun, rather common in high forest, inflorescences lateral, in the axils of oldest (generally decayed) leaves, 22 Nov. 1926, *Deighton* 450 (K).

Liberia : Boporo District ; Javajai, 10 Nov. 1947, *Baldwin* 10277 (K) ; Gola Forest near border between Boporo District and Grand Cape Mount Co. ; at Ba, on Mano River, 18 Dec. 1947, *Baldwin* 10720 (K).

Ivory Coast : valley of the Agniéby, between Attéon and Guébo, swampy forest, 1 Feb. 1907, *Chevalier* 17035 (P) ; Bas Comoé, Malamélasso, under the very humid forest, in large tufts, 7–9 March 1907, *Chevalier* 17532 (P).

Gold Coast : Ancobra River, 16 Dec. 1901, *Johnson* 1006 (K) ; Simpa, wet places in high forest, 60 m., Feb. 1933, *Vigne* 2916 (K).

The inflorescence of this species has a similarly mottled appearance to that of *H. polystachyum* Cherm. in Sect. *Foliigerae*.

12. **Hypolytrum africanum** *Nees ex Steud.*, Syn. Pl. Glum. II. Cyper. 132 (1855).—Sierra Leone, *Don*, *Afzelius*.

Hypolytrum longiscaposum C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 489 (1902) ; Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 472 (1936).—Sierra Leone, *Scott Elliot* 4014, 5050.

Stems 35–95 cm. tall, 1·5–4 mm. thick below, distinctly trigonous, smooth below or only at the base, rough above, including the rhachis, very rough below the inflorescence, clothed in the basal area with large ferrugineous or ferrugineous-margined acuminate bracteate semi-sheathing bladeless sheaths. *Leaves* rather numerous, from about as long as to much longer than the stems, 1–2 cm. wide, with a more or less conduplicate basal part, sometimes very slenderly septate-nodulose, often greyish-green ; *sheaths* with membranous, castaneous margins. *Inflorescence* terminal, a corymbiform panicle 3–8 cm. long and 4·5–15 cm. broad. *Bracts* brown or greenish brown, lower sometimes greenish, shorter to much shorter than their partial panicles, with sometimes an empty one below the inflorescence. *Spikes* numerous, ellipsoid or obovoid in flower, usually subglobose but sometimes ovoid or obovoid in fruit, 4–6 mm. long. *Glumes* cymbiform, 2–2·5 mm. long, margins thinner, light to darker castaneous. *Achenes* mostly oblong-obovate, biconvex, sometimes compressed-biconvex above, slightly more or less 2 mm. long and 1 mm. broad, lower third more slenderly costate-wrinkled and becoming blackish-brown, upper part often with a rather slight basal transverse constriction, smooth but minutely puncticulate, more or less stramineous.

French Guinea : Route Leprince, between the Santa and Timbo, March 1905, *Chevalier* 12815 (P) ; Kouria, banks of the Konkouré, 5 Nov. 1905, *Caille* in *Chevalier* 14933 (P) ; between Dalaba and Mamou, 1–2 Jan. 1909, *Chevalier* 20337 (P) ; Cercle de Faranah, Forekaria, 25

Jan. 1909, *Chevalier* 20522 (P) ; in a patch of moist forest near Mamou, 10 March 1937, *Dalziel* 8430 (K).

Sierra Leone : [without precise locality] *Don* (BM, Herb. Lindley, Camb.) ; near Regent, 8 Dec. 1891, *Scott Elliot* 4014 (BM, K) ; by streams in Talla Hill plateaux, 6 miles north of Kundita, 1050 m., 1 March 1892, *Scott Elliot* 5050 (K) ; edge of stream in forest between York Pass and Waterloo, 6 Dec. 1936, *Deighton* 3343 (K) ; Mt. Horton (Colony), edge of stream, 540 m., 13 Jan. 1952, *Jones* 300 (K).

Liberia : Yeh River, 2 miles above junction with St. Paul River, rich soil of virgin forest, 9 Oct. 1926, *Linder* 1003 (AA, K) ; Vonjama District, Wohmen, in virgin forest, 30 Oct. 1947, *Baldwin* 10057 (K, US).

This, the true *H. africanum* Nees, has for long been confused with *H. heteromorphum* Nelmes.

13. **Hypolytrum senegalense** *A. Rich.* in Pers. Syn. 1 : 70 (1805) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 488 (1902) ; Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 472 (1936).—French Guinea, *Heudelot* 727.

Stems (20-35) 45–90 cm. tall, (0·5–1) 2–4 mm. thick below, obscurely to obtusely or sometimes compressed-trigonous, smooth below, densely scabrid or rough towards the apex, clothed at the base with several large, elongated, ferrugineous, semi-sheathing, scarcely bladed *sheaths*. *Leaves* rather numerous, from shorter to much longer than the stems (5 9) 11–14 mm. wide, but with a more or less conduplicate basal part, very slenderly septate-nodulose in places, often greyish green on the under-surface, sheaths with spadiceous membranous margins. *Inflorescence* a terminal corymbiform panicle (0·5–1·6) 2–4·5 cm. long and (0·8–2·4) 3–4·5 cm. broad, numerously (3 20) spiked. *Bracts* brown or greenish-brown, from a little longer to much shorter than their partial inflorescences, with sometimes an empty one below the whole inflorescence. *Spikes* (3–20) numerous, ellipsoid, obovoid or subglobose, (4–5) 5 6 mm. long. *Glumes* (2) 3–3·25 mm. long, brownish or castaneous-flecked below, upper third or more and very wide margins very thin and whitish-hyaline. *Achenes* elliptic or oblong-elliptic, biconvex, sometimes compressed-biconvex above, (2–2·3) 2·5 2·75 mm. long, (about 1) 1·4–1·6 mm. broad, nearly lower half costate-wrinkled, stamineous to light-brownish, upper part without or rarely with a slight basal transverse constriction, smooth but minutely puncticulate, more or less stramineous.

French Guinea : near the river Nunez, in running water [1838 ?] *Heudelot* 727 (P) ; waterfalls of the Ditinn, April 1905, *Chevalier* 12945 (P) ; margins of the bed of the Kokoulo, April 1905, *Chevalier* 13565 (P) ; waterfalls of the Ditinn river bank, ± 700 m., 14 Nov. 1948, *des Abbayes* 885 (Rennes).

The type specimen is much smaller than the other two gatherings but the colour of the glumes and the surface markings of the achenes are essentially similar in all the specimens, so it seems likely that the type is depauperate. On this assumption I have merged the descriptions but have placed in round brackets the measurements of the type so as to record the striking difference in size.

14. **Hypolytrum elatum** (*Cherm.*) *Nelmes*, stat. nov.

Hypolytrum rhizomatanthum Cherm. var. *elatum* Cherm. in Bull. Soc. Bot. France, 83 : 494 (1936).—Gabon, *Le Testu* 9344.

Stems 35–75 cm. tall, 1–3 mm. thick, scarcely thicker above than below, usually compressed-trigonous to complanate, sometimes obtusely trigonous, more or less rough, especially towards the apex, sulcate, dull greenish, clothed at the base with a few brownish, almost bladeless sheaths or their fibrous remains. *Leaves* numerous, very much longer than the stems, 3·5–4 cm. wide, but with a very rigid conduplicate basal part. *Inflorescence* composed of 1-several shortly or very shortly peduncled subglobose ebracteate heads, 1·5–2·5 cm. in diameter, of numerous sessile, radiant spikes, the whole when composed of several heads forming a larger dense or slightly interrupted globose to pyramidal ebracteate head, 2–4 cm. long and 3–5 cm. broad. *Spikes* distinguishable but not very clearly from one another, about 15–25 in each secondary head, ellipsoid, lanceoloid, or cylindric-lanceoloid, about 8–10 mm. long and 4–5 mm. thick in fruit. *Glumes* rather worn, probably about 3 mm. long, with membranous margins. *Achenes* obovate to elliptic or oblong-elliptic, biconvex, 2–2·5 mm. long, 1·1–1·3 mm. broad, lower half or slightly more with strongly raised wavy-longitudinal lines, sometimes interspersed with tubercles, upper part smooth-punctate, reddish-brown, lower part sometimes blackish-brown ; *beak* very slender, probably the base of the style.

Gabon : Woleu-Ntem ; Amvéné, between the Lara and the Ebélé, steep sloping banks of the Okano, 26 Oct. 1933, *Le Testu* 9344 (B, LeT).

15. **Hypolytrum rhizomatanthum** *Cherm.* in Bull. Soc. Bot. France, 80 : 508 (1933).—Gabon, *Le Testu* 8619.

Stems lateral, rather weak, oblique, 15–30 cm. tall, 0·75–1 mm. thick below, 1–1·75 mm. thick towards the apex, obtusely trigonous to compressed, smooth, or rough, especially above, greenish-brown sometimes tinged purple, clothed at the base with a number of reddish-brown semi-sheathing sheaths. *Leaves* rather numerous, extremely longer than the stems, 1·5–2·5 cm. wide, with a rigid conduplicate basal part. *Inflorescence* composed of very shortly peduncled clusters of numerous sessile spikes aggregated into a dense, bracteate hemispherical to subglobose head, 1–2 cm. long and 1·3–3 cm. broad, rarely with a smaller head a little distance below. *Bracts* several, scarcely subfoliaceous, mostly shorter than, rarely up to as long as, the head, sometimes smaller and quite inconspicuous, strongly nervose, one, empty, sometimes situated well below the head, brownish or purplish. *Spikes* distinguishable from one another but not very clearly so in the fruiting stage, ellipsoid or oblong-ellipsoid, subglobose in fruit, 4 5 mm. long, 1·5–4·5 mm. thick, sessile. *Glumes* about 3 mm. long, with membranous margins. *Achenes* mostly obovate, strongly biconvex, 1·5–1·8 mm. long and 1–1·2 mm. broad, all except a narrow smooth-punctate apical part covered with strongly raised more or less wavy-longitudinal lines considerably interspersed with tubercles, stramineous, becoming brown, small, conical, stipitate basal part dark reddish-brown ; *beak* smooth-punctate, broad but tapering above into a slender dark brown curved style.

Gabon : Haut-Agooué ; Mt. Iboundji, 1000–1100 m., 27 Dec. 1932, *Le Testu* 8619 (LeT) ; Woleu-Ntem ; forests to the north of Mvini (between Oyem and Mimvoul), 2 Aug. 1933, *Le Testu* 9214 (LeT)—Part of this later gathering has its fruits attacked by insects (presumably) and the fruits have become so distorted that one cannot be sure that it is the same species as the other one. Its leaves are greyer green.

16. **Hypolytrum pynaertii** (*De Wild.*) *Nelmes* var. **pynaertii** (*De Wild.*) *Nelmes*, comb. nov.

Hypolytrum gabonicum Cherm. in Bull. Soc. Bot. France, 77 : 277 (1930).—Gabon, *Le Testu* 5150.

Mapania pynaertii De Wild. in Ann. Mus. Congo, Ser. V, 3 : 166, t. 28 (1910).—Belgian Congo, *Pynaert* 1592.

Stems obtusely or obscurely trigonous, rather weak, erect to somewhat curved, 15–75 cm. tall, 0·75–1·75 mm. thick below, sometimes thickening to 1–2 mm. at the apex, smooth, clothed in the basal part with a few brownish, strongly nerved, almost bladeless sheaths. *Leaves* numerous, from slightly to very much longer than the stems, 1–1·5 cm. wide, flat or flattish, not visibly septate-nodulose, scarcely narrowing below into a pseudo-petiole or just a tightly conduplicate basal part, slightly wider at the base, sheaths open with membranous margins which soon fray off. *Inflorescence* composed of numerous (25–35) spikes aggregated into a dense, bracteate head, mainly hemispherical in flower and 1–1·75 cm. long by 1·5–2·5 cm. broad, but mainly more or less globose in fruit and 2–2·5 cm. in diameter. *Bracts* 3 or more, scarcely subfoliaceous, up to 2 cm. long and 2–3 mm. wide, lanceolate or linear-lanceolate, scarcely visible in the fruiting stage except sometimes the lowest, one at least often arising from the stem below the base of the head, brownish green. *Spikes* in flower clearly distinguishable from one another but not very clearly so in the fruiting stage, lanceoloid or cylindric-lanceoloid in flower, varying from about 6 mm. long and 2 mm. thick in the flowering stage, shortly cylindric, less often ovoid, about 1 cm. long and 5–6·5 mm. thick in fruit, sessile, stellate. *Glumes* with apical membranous margins, about 3 mm. long, reddish-brown above, pale below with reddish-brown streaks. *Achenes* broadly elliptic, elliptic-obovate or obovate, strongly biconvex, 3·5–5 mm. long (achene proper, with tapering base, 2·5(–3) mm., beak 1–2 mm. long), 1·25–1·75 mm. broad, thinly covered with strongly raised longitudinal slightly wavy lines, often interspersed below with tubercles, sometimes blackish-brown below, otherwise light brown covered with small reddish-brown dots, tapering to a very slender, pointed base, narrowed above into a beak ; *beak* straight or deflexed, compressed, very broad below, tapering above.

Gabon : between Monila and Ndendi, forest strip in the savannah of the Ngounyé, 22 Dec. 1924, *Le Testu* 5150 (LeT) ; Djona ; Kemboma, margins and banks of the Liboumba, tributary of the Ivindo, 17 Sept. 1932, *Le Testu* 8896 (B, BR, P, LeT) ; ibid., *Le Testu* 8901 (LeT) ; Woleu-Ntem ; forests near the village of Evorombil, in the Ntem, at 15 km. from Mimvoul, 1 April 1933, *Le Testu* 9070 (LeT) ; near the village of Bilo, margins of the Ncom, at 18 km. north of Mimvoul, 17 Aug. 1933, *Le Testu* 9241 (LeT).

Belgian Congo : Eala, July 1906, *Pynaert* 1592 (BR).

The plant described as *Mapania pynaertii* is represented by a single immature gathering, but it matches well similarly immature plants of Chermezon's *H. gabonicum*.

There is a comment on this remarkable species and its variety in the introduction.

16. **Hypolytrum pynaertii** (*De Wild.*) *Nelmes* var. **plicatum** (Cherm.) *Nelmes*, comb. nov.

Hypolytrum gabonicum Cherm. var. *plicatum* Cherm. in Bull. Soc. Bot. France, 83 : 494 (1936).—Gabon, *Le Testu* 9253.

Stems 7 28 cm. tall, 0·6–1·2 mm. thick below, sometimes slightly thicker towards the apex. *Leaves* 5–8 mm. wide, almost all completely conduplicate, only rarely flattening out above. *Inflorescence* composed of about 5–24 spikes aggregated into a dense bracteate head, 1–1·8 cm. long by 1–2·5 cm. broad, but mainly more or less globose in fruit and 1·5–2 cm. long by 2–2·8 cm. broad. *Bracts* 3–5 or more, up to about 1 cm. long. *Spikes* clearly distinguishable from one another, ellipsoid, lanceoloid, or cylindric-lanceoloid, about 6–12 mm. long in flower and fruit, 2–3 mm. thick in flower, 4–6 mm. in fruit.

Gabon : Woleu-Ntem ; Evorombil, margins (banks) more or less inundated by the Ntem, 21 Aug. 1933, *Le Testu* 9253 (B, LeT).

Differing from var. *pynaertii* principally by its shorter and more slender stem, and its narrower and folded leaves, and its somewhat looser head of spikes, which give it a quite distinct appearance.

17. **Hypolytrum scaberrimum** *Boeck.* in Flora, 1882 : 26.—Gabon, *Soyaux* 153b.

Mapania scaberrima (Boeck.) C. B. Clarke in Durand & Schinz, Conspect. Fl. Afr. 5 : 667 (1895).

Stems (2) pulled away from *rhizome*, erect to somewhat curved, obscurely to compressed-trigonous, somewhat weak, 38–44 cm. tall, about 2 mm. thick throughout, smooth below, shortly but considerably rough above, and clothed in about the basal 10 cm. with short, obtuse (lower) to much longer, acuminate (upper), strongly nervose, greenish-ferrugineous, nearly bladeless sheaths. *Leaves* numerous, very much longer than the stems, 15–17 mm. wide, not septate-nodulose, scarcely narrowing below into a conduplicate basal part ; *sheaths* open with ferrugineous membranous margins which fray off. *Inflorescence* composed of very numerous spikes (in flower) aggregated into a dense, almost ebracteate, globose head, 16–22 mm. in diameter. *Bracts* apparently 1 or 2, scarcely subfoliaceous, hidden by the stellately spread spikes. *Spikes* (in flower) clearly distinguishable from one another, 6·5–7 mm. long and nearly 3 mm. broad, ellipsoid or ellipsoid-lanceoloid, sessile, stellate. *Glumes* 3 3·5 mm. long, 2–2·5 mm. wide, dark reddish-brown to spadiceous above, paler or pale below, scurfy in appearance at the apex. *Achene* quite undeveloped.

Gabon : Munda, Sibange Farm, in forest, 7 Jan. 1881, *Soyaux* 153b (K).

So far as such an immature specimen can be determined, this seems to be very close to *H. pynaertii* but is probably specifically distinct.

NOTES ON CYPERACEAE : XXXIV.

E. Nelmes

Allies of Carex flava L. in the Southern Hemisphere.

Carex flava L. and its closest allies, bearing yellowish or yellowish-green utricles at maturity, occur all round the North Temperate regions, and they are becoming much better known than formerly. It is, however, a different story concerning those members of the group which have been collected in the Southern Hemisphere. The identification and nomenclature of these are in a confused state. Kükenthal, in his monograph (Engl. Pflanzenreich, IV, 20 : 675 : 1909), classified them all as *C. oederi* Retz. var. *cataractae* (R. Br.) Kükenth. (The combination *C. oederi* Retz. was formerly erroneously used in place of *C. serotina* Mérat, a European species). Ten years earlier (Engl. Bot. Jahrb. 27 : 545 : 1899) he had described a South American gathering as *C. flava* L. subsp. *brevirostrata*. *C. serotina* somewhat resembles *C. cataractae* R. Br. but is not so nearly related to the other Southern members of the group.

The treatment below is based on specimens in the Kew Herbarium plus an examination of Robert Brown's type of *C. cataractae* at the British Museum (Natural History) and comparison with his type number at Kew.

It is hoped that this paper will stimulate students of *Carex* in the South and particularly in Tasmania to add to our present knowledge of these sedges. All the Tasmanian specimens of *C. flaviformis* and two of the three gatherings of *C. cataractae* from this island in the Kew Herbarium were collected more than a century ago !

At the end of this paper are short descriptions and citations of the European plants, *C. demissa* Hornem. and *C. serotina* Mérat, both of which have been found as aliens in New Zealand and one of them in Tasmania.

It may seem unnecessary to give a key to the four native species since they are widely separated, except the Tasmanian one whose area has been invaded by the New Zealand species, but it is a means of readily noting their chief distinguishing characters, and the key has been so arranged that the two species occurring in Tasmania are closely contrasted.

Key to the Southern " flavas ".

Stems 2–3 cm. tall ; spikes 3–4, terminal one 4–7 mm. long ; utricles 4–5 mm. long . . . . . *C. monotropa*

Stems 6–50 cm. tall ; spikes 4–6 (7), terminal one 1–2·5 cm. long ; utricles 2·75–4·25 mm. long :

Spikes contiguous or somewhat crowded, terminal 1·5–2·5 cm. long, lateral ones 7–18 mm. long, beak of utricle sometimes very sparsely hispidulous on the margins . . . . . *C. barrosii*

Spikes densely crowded, terminal 1–1·5 cm. long, lateral ones 5–15 mm. long, beak of utricle glabrous :

Stems 6–17 cm. tall ; female glumes 2–3 mm. long ; utricles obovoid or ellipsoid-obovoid, 3·5–4 mm. long . *C. flaviformis*

Stems 18–50 cm. tall ; female glumes 1·5–2 mm. long ; utricles ellipsoid, 2·75–3·25 mm. long . . . . . *C. cataractae*

Carex flaviformis *Nelmes*, sp. nov. ; affinis *C. flavae* L., sed culmis brevioribus, spicis magis numerosis lateralibus plerumque androgynaeceis, glumis femineis brevioribus, utriculis brevioribus praecipue differt.—New Zealand, *Cheeseman*.

Loosely tufted. *Rhizome* extremely short. *Stems* erect to slightly curved, trigonous, 6–17 cm. tall, 1–1·25 mm. thick, smooth. *Leaves* occupying, sheathing, and clothing from the lower half to most of the stem, mostly more or less twice as long as the stem, 2–4 mm. wide, flat or flattish. *Spikes* 4–6 or 7, all densely crowded at the apex of the stem or one infrequently 2·5–11 cm. lower down the stem, terminal male or sometimes androgynaeceous, when male, cylindric, 1–1·5 cm. long, 1·25–2·75 mm. thick, lateral spikes suberect to very widely spreading, female or androgynaeceous, lower more often female upper more often androgynaeceous, shortly cylindric to ovoid, 6–15 mm. long, 6–8 mm. thick, dense-flowered, upper lateral spikes sessile or subsessile, lower scarcely or shortly exserted-peduncled. *Bracts* of the two lower spikes foliaceous or subfoliaceous and, excluding the distant one, when present, much exceeding the inflorescence, upper spikes very shortly or scarcely bracteate, lowest sheathing, others not or scarcely sheathing. *Female glumes* more or less oblong with a rounded apex, oblong-ovate, or ovate with a tapering apex, cymbiform to flattish, apex obtuse or, more often, very obtuse to rounded or truncate-rounded, 2–3 mm. long, 1–2 mm. wide, pale to yellowish or fulvous with an irregularly narrow to wide, thin and whitish-hyaline margin, midrib usually not but sometimes shortly excurrent. *Utricles* obovoid or sometimes ellipsoid-obovoid but tapering at each end, subinflated or obscurely trigonous, 3·5–4 mm. long, 1·4–1·6 mm. broad, membranaceous, rather strongly several nerved dorsally and ventrally, narrowly marginate, glabrous, straight or straightish, patently spreading at maturity, becoming bright yellowish or greenish-yellow, not or scarcely stipitate ; *beak* tapering below, terete or compressed-terete, 1–1·5 mm. long, narrowly marginate, glabrous, subentire or shortly bidentulate, mouth straight. *Achene* pyriform or obovoid but tapering below, distinctly trigonous with the angles conspicuously thickened, especially at about halfway, about 1·5 mm. long (excluding beak), 1–1·2 mm. broad, brown, angles pale, scarcely to shortly and stoutly stipitate, abruptly beaked at the rounded or truncate-rounded apex ; *beak* slender, pale, about 0·2 mm. long. *Style* long and slender. *Stigmas* 3.

New Zealand : South Island ; Canterbury, 1860–61, *Sinclair* and *Haast* 97 (K) ; R. Waitaki, deep gullies, 300 m., 1863, *Haast* 121 (K) ; Canterbury, 1862, *Haast* 571 (K) ; Otagi, Waitaki Valley, lake district, swampy ground, 6 Nov. [1864 ?], *Hector and Buchanan* (K) ; Lake Letitia, 1867, 690 m., *Armstrong* 259 (K) ; Canterbury, Lake Tekapo, 750 m., comm. Sept. 1883, *Cheeseman* (K) ; Mt. Arthur Plateau, 1200 m., Jan. 1886, *Cheeseman* (K) ; Canterbury Alps, Jan. 1887, *Cheeseman* (K) ; Kowai River, Jan. 1947, *Cooke* 1120 (K). North Island ; Waimarino Plateau, 600 m., *Cooke* 1079 (K).

Tasmania : Lake St. Clair, 7 Jan. 1841, *Gunn* 1411 (K) ; Marlborough, 9 Jan. 1841, *Gunn* 1411 (K) ; Arthur's Lakes, 17 Jan. 1845, *Gunn* 1411 (K).—Alpine marshes.

The Tasmanian specimens of this species were misidentified as *C. cataractae* R. Br. by Boott in Hook. f., Fl. Tasman. 2 : 101, t. 151, pl. dextra (1868).

The New Zealand representatives were wrongly determined as *C. flava* L. by Bentham, Fl. Austral. 7 : 444 (1878) ; by Cheeseman in Trans. N.Z. Inst. 16 : 439 (1884), and in his Manual of the New Zealand Flora, 835 (1906) (in his ed. 2, 1925, he followed Kükenthal in treating them as *C. oederi* Retz. var. *cataractae* (R. Br.) Kükenth.), and as *C. cataractae* R. Br. by J. D. Hooker in his Handbook of the New Zealand Flora, Pt. I, 315 (1864).

Carex cataractae *R. Br.* Prodr. Fl. Nov. Holland. 242 (1810) ; Kunth, Enum. Pl. 2 : 522 (1837) ; Boott, Illustr. 4 : 204 (1867) ; F. Muell., Fragm. 8 : 250 (1874).—Tasmania, *R. Brown* 6085.

C. oederi Retz. var. *cataractae* (R. Br.) Kükenth. in Engl. Pflanzenr. IV, 20 : 675 (1909).

Loosely tufted. *Rhizome* extremely short. *Stems* erect or suberect, trigonous, 18–50 cm. tall, about 1 mm. thick below, smooth. *Leaves* basal and subbasal, shorter to longer than the stem, 1·5–3 mm. wide, flat or flattish. *Spikes* 4–6, all densely crowded at the apex of the stem or sometimes 1 much lower down the stem, terminal usually male but sometimes androgynaeceous or gynaecandrous, when male, cylindric, 1–1·5 cm. long and about 2 mm. thick, lateral spikes suberect to widely spreading, female ovoid or ovoid-cylindric to subglobose, 5–10 mm. long, 4–6 mm. thick, sometimes lowest compound with several smaller spikes branching from its base, upper spikes sessile or subsessile, lower scarcely or shortly exserted-peduncled. *Bracts* of the lower 1–2 spikes foliaceous or sub-foliaceous and, excluding the distant one when present, at least one much exceeding the inflorescence, upper female spikes very shortly or scarcely bracteate, lowest shortly others not sheathing. *Female glumes* more or less oblong with a rounded apex or, quite as often, oblong-obovate, less commonly ovate, apex always very obtuse or rotund, 1·5–2 mm. long, 1–1·5 mm. wide, wholly whitish with a light green midrib-stripe, sometimes castaneous above and towards the margins, midrib not or scarcely excurrent. *Utricles* ellipsoid but tapering at each end, especially above, obscurely trigonous, 2·75–3·25 mm. long, 1–1·2 mm. broad, membranaceous, rather strongly several-nerved dorsally and ventrally, narrowly marginate, glabrous, straight or straightish, patently spreading at maturity, light dull stramineous-brown, not or scarcely stipitate ; *beak* tapering below, terete or compressed-terete, about 1 mm. long, narrowly marginate, glabrous, light dull greenish, subentire or very shortly bidentulate, mouth straight. *Achene* ellipsoid or ellipsoid-obovoid, distinctly trigonous, angles slender, 1·25–1·75 mm. long (excluding beak), about 1 mm. broad, light bright brown including angles, becoming very dark brown, scarcely stipitate, abruptly slenderly and very shortly and pale-beaked. *Style* long and slender. *Stigmas* 3.

Tasmania : Port Dalrymple, 1804, *R. Brown* 6085 (BM, K) ; without precise locality, Dec. 29, 1837, *Gunn* 578 (K) ; Swanport, *Story* [" Herb. F. Mueller 1877 "] (K).

On the evidence provided by material in the Kew Herbarium, it has been clear to me for a long time that two distinct *Carices* in Tasmania have been treated as one since Robert Brown described *C. cataractae* more than a century and a half ago. The type and other specimens of *C. cataractae* are taller and more slender in most of their parts than the other species. They are a somewhat similar pair of species to *C. serotina* Mérat and *C. flava* L. of Europe. *C. cataractae* seems confined to Tasmania but the second species appears to be conspecific with that, under the name *C. cataractae*, which, as Kew records show, has been widely collected in the South Island of New Zealand. There seems little doubt about this New Zealand plant being the same as the second Tasmanian one, but the 3 Kew specimens are scrappy and were collected by *Gunn* as long ago as 1841 and 1845. It would be very interesting to see modern specimens of this plant from Tasmania. In the circumstances I have chosen a New Zealand gathering as the type.

Carex monotropa *Nelmes*, sp. nov. ; affinis *C. flaviformi* Nelmes, sed culmis brevioribus, spicis brevioribus, utriculis ellipsoideis longioribus differt.—Basutoland, *Killick* 1847.

Loosely tufted. *Rhizome* extremely short. *Stems* erect, trigonous, 2–3 cm. tall, 0·5–1 mm. thick, smooth. *Leaves* sheathing and clothing all the stem, up to rather more than twice its length, 1·5–3 mm. wide, flat to somewhat folded. *Spikes* 3 or 4, all densely crowded at the apex of the stem, terminal usually male, sometimes female, about 4–7 mm. long, when male slenderly (1–1·5 mm.) cylindric, lateral spikes widely or rather widely spreading, female, more or less globose, 5–7 mm. long, 4–6 mm. thick, subdense-flowered, subsessile or scarcely to shortly exserted-peduncled. *Bracts* of the lateral spikes foliaceous or subfoliaceous, slightly to much exceeding the inflorescence, shortly sheathing. *Female glumes* ovate, oblong-ovate, or ovate-lanceolate, flattish to cymbiform, apex very obtuse to truncate-rounded, 2·5–3 mm. long, 1·2–1·6 mm. wide, pale or pale greenish below and rich castaneous above except for a greenish stripe along the midrib area, midrib not excurrent. *Utricles* not quite mature, ellipsoid but tapering at each end, especially above, compressed-trigonous, 4–5 mm. long, 1·25–1·5 mm. broad, membranaceous, strongly and rather closely nerved on each face, narrowly marginate, glabrous, straightish, not widely spreading, pale below, green above, not stipitate ; *beak* tapering below, compressed, 1·25–1·5 mm. long, narrowly marginate, glabrous, straight, green, shortly bidentate ; *teeth* straight. *Achene* not fully developed, obovoid, trigonous, 1·25–1·5 mm. long, about 1 mm. broad, shortly and slenderly beaked.

Basutoland : Mont aux Sources, 2850 m., Jan. 1894, *Flanagan* 2013 (K) ; between Indumeni Dome and Castle Buttress, common in moist parts of alpine grassland, 2910 m., 5 Dec. 1952, *Killick* 1847 (K, NU, PRE).

This very short plant with the crowded spikes at first glance reminds one of the British coastal form of *C. serotina* Mérat, but closer examination shows that the utricles of the South African plant are about twice the size

of those of *C. serotina*, and of the other European species of the group I would place *C. monotropa* nearest to *C. flava* L. itself.

It is fascinating to speculate on how this plant, whose loneliness is indicated in its epithet, reached its high and isolated home. Its nearest relatives are in Argentina, in Tasmania, and beyond the Sahara barrier to the north. Still, *C. barrosii* is similarly isolated, and to a less degree the two Australasian species.

Carex barrosii* Nelmes, sp. nov. ; affinis *C. demissae* Hornem., sed culmis erectis, spicis lateralibus longioribus, glumis femineis brevioribus angustioribus, utriculis anguste ellipsoideis praecipue differt.—Argentina, *Eyerdam & Beetle* 24612.

Loosely tufted. *Rhizome* very short. *Stems* erect, trigonous, 20–34 cm. tall, 1–1·75 mm. thick below, smooth. *Leaves* mostly basal but some subbasal, slightly to much shorter than the stems, 2–5 mm. wide, flat or flattish. *Spikes* 4–5, usually all but one somewhat crowded or contiguous at the apex of the stem, the lowest usually at a node 4–11 cm. distant down the stem, terminal usually male but sometimes androgynaeceous, gynaecandrous, or nearly wholly female, when male, cylindric, 1·5–2·5 cm. long and 1·75–2·25 mm. thick, lateral spikes suberect to obliquely spreading, female, or rarely a few male flowers at the apex, shortly cylindric to cylindric-ovoid, 7–18 mm. long, 6–8 mm. thick, dense-flowered, upper spikes sessile or subsessile, lower scarcely or shortly exserted-peduncled. *Bracts* of the lower 1–2 (3) spikes foliaceous to subfoliaceous and, excluding the distant one, two much exceeding the inflorescence, uppermost female spike shortly or scarcely bracteate, lowest scarcely or shortly others not sheathing. *Female glumes* more or less oblong or gradually narrowing upwards, with a very obtuse to rounded or truncate-rounded or slightly bilobed-emarginate apex, 2–2·5 mm. long, 0·9–1·1 mm. wide, whitish below, upper third especially towards the margins, or usually less, castaneous with sometimes a narrow and irregular whitish edge, midrib usually not but sometimes very shortly excurrent. *Utricles* narrowly ellipsoid but tapering at each end, especially above, subinflated and obscurely trigonous, 3·5–4·25 mm. long, 1–1·5 mm. broad, membranaceous, rather strongly several nerved dorsally and ventrally, extremely narrowly marginate, glabrous, straight or sometimes very slightly curved, subpatently to patently spreading at maturity, becoming bright yellowish, or yellowish-green below, not or scarcely stipitate ; *beak* tapering, subgradually from the utricle proper, then gradually to the apex, terete or compressed-terete, 1–1·5 mm. long, very narrowly to scarcely marginate, glabrous or sometimes very sparsely hispidulous on the margins, especially above, bidentulate ; *teeth* straight or straightish. *Achene* subpyriform or obovoid but tapering below, distinctly trigonous, angles slender, 1·3–1·5 mm. long (excluding beak), about 1 mm. broad, nut-brown including angles, very shortly and stoutly pale-stipitate, abruptly beaked at the rounded apex ; *beak* slender, pale, about 0·2 mm. long. *Style* long and slender. *Stigmas* 3.

Chile : in grassland, Huiti, Jan. 1852, *Lechler* 755 (K) ; Prov. Magallanes, Lago Pehue, 50 m., Feb. 1931, *Hicken* 476 (K) ; Llanquihue, Vega del Cayutué, 10 Jan. 1945, *Rudolph* 16121 (K).

* Named in honour of Dr. Manuel Barros, the distinguished South American Cyperologist.

Argentina : Rio Negro, Depto, San Carlos de Bariloche, on west shore of Lago Nahuel Huapi, in heavy sand and gravel mixed with mud and rocks, 850 m., 5 Feb. 1939, *Eyerdam & Beetle* 24612 (K).

These southern American plants seem to me distinctly closer to the European *C. demissa* Hornem. than to any one of the North American species of this group.

Dr. Manuel Barros, the monographer of Argentine *Cyperaceae*, joins Kükenthal in regarding them as belonging to *C. oederi* Retz. var. *cataractae* (R. Br.) Kükenth.

C. B. Clarke, in the Kew Herbarium, determined the *Lechler* number as *C. inconspicua* Steud., which I follow Kükenthal in regarding as more closely related to *C. fuscula* D'Urv. and the European *C. extensa* Gooden.

I have not seen the *Neger*, Concepcion, Chile, specimen on which Kükenthal founded his *C. flava* L. subsp. *brevirostrata* (Engl. Bot. Jahrb. 27 : 545 : 1899), and which he in his later monograph in Engler's Pflanzenreich made synonymous with *C. oederi* Retz. var. *cataractae* (R. Br.) Kükenth.

In addition to the four native species there are at least one and probably two apparently alien species of these yellow sedges from the Southern Hemisphere in the Kew Herbarium. These are *C. demissa* Hornem. and *C. serotina* Mérat. There are one gathering from Tasmania and two from New Zealand of *C. demissa* and with one of the New Zealand gatherings is a single rather poor plant of what appears to be *C. serotina*. These are both rather common species in Europe, including Britain.

Here follow short descriptions of the two species including the chief distinguishing characters.

Carex demissa Hornem.—*Stems* semidecumbent to more or less erect, 5–50 cm. tall. *Leaves* 2–4·5 mm. wide, flat or flattish. *Spikes* 3–6, upper crowded to approximate, lower more distant from one another, lowest usually distant or remote, terminal male, lateral female, the female spikes 5–13 mm. long and 5–8 mm. thick in fruit. *Female glumes* 2·5–3·5 mm. long, ovate, oblong-ovate, or oblong-lanceolate, apex obtuse or very obtuse, muticous or mucronulate. *Utricles* subinflated-trigonous, obovoid or obovoid with a tapering base, 3–4·5 mm. long, plurinerved, straight to slightly curved ; *beak* about as long as the rest of the utricle.

Tasmania : Eaglehawk Neck, Nov. 1924, *Lucas* 20805 (K, NSW).

New Zealand : North Island ; Waimarino, 7 Jan. 1948, *Cooke* 1144, in part (K). South Island ; Greymouth, March 1942, *Pullar* 309 (K).

Carex serotina Mérat.—*Stems* erect, 2·5–20 cm. tall. *Leaves* 1–3 mm. wide, more or less canaliculate. *Spikes* 3–6, crowded at the apex of the stem, terminal usually male, lateral female, the female spikes 4–9 mm. long and 4–6 mm. thick in fruit. *Female glumes* 1·5–2 mm. long, oblong-ovate, apex obtuse or very obtuse, muticous. *Utricles* subinflated-trigonous, obovoid, 2–3 mm. long, plurinerved, straight ; *beak* about half as long as the rest of the utricle.

New Zealand : North Island ; Waimarino, 7 Jan. 1948, *Cooke* 1144, in part (K).

NOTES ON CYPERACEAE, XXXV.

E. Nelmes

A New Carex from South Africa.

Carex killickii *Nelmes*, sp. nov. ; affinis *C. archeri* Boott sed spica longiore, glumis femineis longioribus nervo mediano apicem plerumque non attingente, utriculis longioribus plurinervosis, rhachilla longiore differt.—Basutoland, *Killick* 1848.

Loosely tufted. *Rhizome* curved-horizontal to obliquely descending, very slender (0·4–0·5 mm. in diameter), with long internodes (up to 2 cm.). *Stems* erect or curved, compressed-trigonous, firm, 6–13 cm. tall, smooth. *Leaves* basal and subbasal, usually shorter to much shorter than but sometimes slightly exceeding the stems, thick, more or less canaliculate, less than 1 mm. wide, mostly more or less curved, stiff, lower sheaths pale or light-brown, eventually fraying, leaf-apices longly attenuated. *Spike* 1, androgynaeceous, oblong-cylindric or oblong-elliptic, 6–10 mm. long and 2·5–3·5 mm. broad, sublax, male and female parts each about 2–3-flowered. *Bract* glumiform at the base, setaceous to subfoliaceous above, from about as long to three times as long as the spike, and situated at or a little below its base. *Female glumes* lanceolate or oblong-lanceolate, incurved-conduplicate, apex acute or obtuse, 4–5 mm. long, 1·75–2 mm. wide, glabrous, brownish-castaneous or fulvous with narrowly to widely whitish margins and a green midrib which fails to reach the whitish apex, rarely lowest more or less excurrent. *Utricles* very immature, and in this condition oblong-trigonous, 5–6 mm. long, about 0·5 mm. broad, plurinerved, glabrous, straight, green except for a brownish-castaneous beak-like portion with a whitish apex, shortly stipitate ; *beak* at this stage not differentiated, whitish apex very oblique. *Achene* undeveloped. *Stigmas* 3. *Rhachilla* subsetaceous, margins scaberulous, about 3 mm. long.

South Africa : Basutoland ; between Indumeni Dome and Castle Buttress, abundant in moist parts of Alpine grassland, 2900 m., 5 Dec. 1952, *Killick* 1848 (K, NU, PRE).

Mr. Killick's sedge is a very interesting one for several reasons. It bears a rhachilla, arising from the base of the achene, within the utricle. It is isolated from other unispicate *Carices* of which there is none known in South and South Tropical Africa. Yet, at the same time, it nearly halves the long distance between the two parts of its own small group of species, two or three of which occur in Australasia and a similar number in southern South America.

In his monograph[1] of the *Cyperaceae-Caricoideae*, 1909, Kükenthal formed the 60 known unispicate *Carices* into his subgenus *Primocarex*. This is an artificial grouping with unispicateness the only qualification for inclusion, so that the occupants of the subgenus are very heterogeneous. Nearly half of them, including the new *Carex killickii*, are rhachilla-bearing. In a paper[2] published several years ago I ventured the opinion that those *Primocarices* with a rhachilla were not true *Carices*, but had evolved from one or another of the other genera of the tribe *Cariceae*, *Schoenoxiphium*, *Kobresia*, and *Uncinia*, but mostly from *Uncinia*. This view has been challenged by Savile and Calder[3] whose own views on

phylogeny in *Carex* are based on relationships between species of this genus and smut fungi.

When considering[2] the subdivision of *Primocarex* to which *C. killickii* belongs, Sect. *Unciniaeformes* Kükenth. Subsect. *Aciculares* Kükenth., it was pointed out that it comprised two or three species from Australasia and a similar number from southern South America, and Rodway's theory of a former land bridge between these two widely separated areas was mentioned. It seems to me that the discovery of *C. killickii* has not only profoundly narrowed the gap between its Australasian and South American allies, but also tended to confirm the land bridge theory and the suggestion that these and other rhachilla-bearing 'Carices' had an Antarctic and uncinioid origin.

Until 1921–22 only two *Primocarices* were known to occur in Africa. These are a closely related pair, one in Ethiopia and a variety along with the other species in Kenya. They are large, rhachilla-bearing plants and one of them is leafless. I have suggested[2] that they had a kobresioid origin. A third unispicate sedge was collected on Mt. Aberdare, west Kenya, in 1921-22. This is *C. peregrina* Link, known up to its discovery in Kenya only from Madeira and the Azores. It sometimes has a rhachilla but there are only two stigmas: most rhachilla-bearing *Primocarices* have three. With the two other members of its subsection it may have descended from Australasian *Uncinia* or similar uncinioid sedges.

References.

1. Kükenthal, G. *Cyperaceae-Caricoideae*. Engler, Das Pflanzenreich, IV, 20 : 1909, 824 pp., 128 text figs.

2. Nelmes, E. Facts and Speculations on Phylogeny in the Tribe *Cariceae* of the *Cyperaceae*. I. General Considerations. Kew Bull. 1951 : 427–436 (1952).

3. Savile, D. B. O., and J. A. Calder. Phylogeny of *Carex* in the Light of Parasitism by the Smut Fungi. Canad. Journ. Bot. 31 : 164–174 (1953).

NOTES ON CYPERACEAE : XXXVI.

E. Nelmes

New Annual Species of Pycreus from Tropical Africa. II*

Pycreus melanacme *Nelmes*, sp. nov. ; affinis *P. pauperi* (Hochst. ex A. Rich.) C. B. Clarke sed spiculis magis numerosis, bractea superiore longiore, glumarum apicibus haud acutis, achaeniis puncticulato-papillosis differt.—Northern Rhodesia, *Mrs. H. M. Richards* 725.

Annual herb. *Stems* erect or slightly curved, obtusely trigonous, slenderly ribbed, very slender, 12–20 cm. tall, smooth. *Leaves* few, situated only at and near the base of the stem, shorter, usually much shorter, than the stem, filiform ; *sheaths* reddish or vinaceous in places. *Anthela* simple, contracted, 1–3- (4)-spiculate. *Bracts* 1–2, lower foliaceous from a glumiform base, more or less erect, thus appearing to be a prolongation of the stem, up to 15 cm. long, upper bract reduced to an aristate glume. *Spikelets* digitate and sessile at the apex of the stem, compressed, oblong-lanceolate or more or less elliptic, 5–10 mm. long, 3–4 mm. broad, 4–14-flowered. *Glumes* densely imbricate, ovate or oblong-ovate, apex apiculate, acute, about 3 mm. long, glabrous, bright yellowish, sometimes with small bright reddish patches, but pale at the base and pale or light greenish along the midrib and two closely adjacent nerves, which converge at the blackish or reddish-black apex, to form a firm tip. *Stamens* 2 or 3. *Achenes* obovoid-biconvex, 1·4–1·5 mm. long, about 1 mm. broad, densely puncticulate-papillose, becoming sooty-black, extremely shortly and stoutly stipitate, extremely shortly beaked. *Stigmas* 2.

Belgian Congo : Haut-Katanga ; 10 km. S.W. of Elizabethville, humid and rather shady part of open forest, Jan. 1948, *Schmitz* 1294 (BR, K).

Northern Rhodesia : Abercorn District ; on the left of the Mpulungu to Abercorn road, close to Tsetse control, native huts, 1500 m., very sandy ground among rocks, 1 Feb. 1952, *Mrs. H. M. Richards* 725 (K).

This is a very pretty sedge with its black-tipped yellow glumes. It is superficially much like *P. pauper* but differs from it in several characters, particularly the surface of the achene. This in *P. melanacme* is puncticulate-papillose while the achene of *P. pauper* has a transversely undulate-muriculate-zonate surface.

Pycreus acaulis *Nelmes*, sp. nov. ; affinitate nulla obvia, ab omnibus congeneribus habitu acauli, glumis curvatis, stamine unico, achaeniis minimis differt.—Nyasaland, *G. Jackson* 870.

Annual herb. *Stems* absent or extremely short and hidden beneath the inflorescence, which consists of crowded spikelets situated among the leaves and just above a mass of fibrous roots. *Leaves* and leafy *bracts* arising from among and below the spikelets and from exceeding to very much exceeding them in length, subfiliform. *Spikelets* sessile or subsessile, compressed, more or less ovate, 3–6 mm. long, 2–3·5 mm. broad, 6–14-flowered. *Glumes* densely imbricate, oblong-lanceolate, apex acute

* Continued from K.B. 1951 : 321 (1952).

to subobtuse, mostly slightly to moderately curved, 2–3 mm. long, glabrous, pale or greenish with brownish-red sides and undulate whitish margins to almost wholly reddish-crimson, midrib greenish, from not quite reaching the apex of the glume to very shortly excurrent. *Stamen* 1. *Achenes* mostly oblong with rounded corners, biconvex or compressed biconvex, 0·8–1 mm. long, 0·4–0·5 mm. broad, densely but minutely puncticulate-papillose, dark brown, scarcely stipitate or beaked. *Stigmas* 2.

Nyasaland : North Nyasa District ; Nyika Plateau, Kaulime Pond, growing in pure peat soil, 27 June 1952, *G. Jackson* 870 (K).

Pycreus acaulis appears to be the only known stemless species of this genus and even of the tribe *Cypereae*, and this stemless condition is undoubtedly rare in the family *Cyperaceae*.

Modern Mushroom Cultivation.*—It is often said that the practical application of scientific discoveries to commercial problems involves a considerable time lag. This may in part be due to the publication of the results of scientific research in inaccessible technical journals. With the publication of this book, however, Mr. Richards has brought together the very latest information on mushroom culture, based on many years of experience with this crop, and the result of much research which has been carried out at Cheshunt Research Station, of which he is nursery manager.

The author states that the object of this work is primarily to help the beginner and the amateur, but there is also a wealth of information directed toward commercial growers. The first seven of the nine chapters are arranged according to a sequence of events starting with selection of a site for the mushroom bed and ending with crop maintenance and harvesting. The novice who plans to grow mushrooms for the first time, would be well advised to read and re-read those entitled " Composts and Methods of Composting ", " Making the Beds ", " Mushroom Spawn ", " Casing the Beds " and " Routine Management". Provided he acts upon this information he can reasonably expect a good yield. The final chapter " Diseases and Pests " deserves special mention as the symptoms of the various diseases which are liable to attack the crop are both well described and illustrated, and methods of control given. There is an appendix with information on calculating cubic capacity, and another containing a very useful list of specialist firms which supply various products needed by mushroom growers.

This little book, which is profusely illustrated with photographs, is thoroughly recommended for amateur and professional growers.

Derek A. Reid.

* Modern Mushroom Cultivation. By A. A. Richards. London : W. H. & L. Collingridge Ltd. New York : Transatlantic Arts Inc. 1954. Pp. 96. 35 photographs, and 2 line drawings. Price 8s. 6d. net.

NOTES ON ASIATIC GRASSES : XXIII.

Jansenella Bor, a new genus of Indian Grasses.

N. L. Bor

The species called *Arundinella avenacea* Munro in the Flora of British India has always been a puzzling species. The first account of it in the literature appears in Griffith's Notulae, **3,** 55-56 (1851) where he describes this very species as *Aira* sp. He provided an illustration in Icones Plantarum Asiaticarum under the name *Aroideum* on plate 146, III, but refers to the plate as *Airae* sp. in the index. In his description in the Notulae, he speculates whether it does not in fact belong to another genus in the words " an *Danthonia* ? " C. Mueller actually did publish this species in Bot. Zeit. **14,** 348 (1856) as a *Danthonia*, calling it *D. griffithiana*, antedating Munro's specific epithet by eight years.

The necessary combination in *Arundinella* was made by the writer in Ind. For. Rec. Bot. **1,** 3, 73 (1938).

It, however, seemed to be entirely out of place in *Arundinella* because of the nature of its upper lemma which is decorated with two tufts of hair at the base of the long aristate triangular lobes, not to mention the extraordinary palea, of which more later.

Using C. E. Hubbard's key to the genera of the *Arundinelleae* in Kew Bull. **1936,** 317 (1936), the genus *Danthoniopsis* seemed to be the correct genus for its reception. At any rate, it seemed more at home in *Danthoniopsis* than in *Arundinella* and the combination in *Danthoniopsis* was made in Flora of Assam, **5,** 187 (1940).

Recently the status of this species has had to be reconsidered and the steps which led to the establishment of a new genus to contain this aberrant species are detailed in the adjacent table.

A glance at this table reveals that in the extremely important matter of the hilum of the grain, this is punctiform in the genus *Arundinella*, while in all the other genera it is linear. *Arundinella avenacea* Munro also has a punctiform hilum, and in this respect is closer to *Arundinella* than to the other genera. Another resemblance between the two is the membranous ligule, while all the other genera have a ligule which is represented by a rim or fringe of hairs. It differs from *Arundinella* in so many other characters particularly in the structure of the lemma of the upper floret, that it is quite obvious that it cannot remain in that genus.

Neither can it remain in *Danthoniopsis*, although the lemma or the upper floret is similar in both, principally because of the difference in ligule and hilum, but also because of the extraordinary palea of the upper floret—a palea which is so different from anything else in the tribe that it immediately puts *Arundinella avenacea* Munro in a class apart.

The palea of the upper floret is oblanceolate in shape, 2-keeled, with very narrow flaps. Between the two keels on the adaxial surface, there is a growth of one-celled hairs. These hairs are slender and pointed in the lower part, but increase in thickness from below upwards, and at the same time become more and more blunt, so that towards the apex of the palea they look like elongate papillae. I cannot recall having seen any one-celled hairs like these in any genera of the *Gramineae*, and they are

A Comparative Analysis

	Jansenella *Bor*	**Arundinella** *Raddi*	**Trichopteryx** *Ne*
Ligule	very narrow membrane forming a convex arch	narrow truncate horizontal membrane	a hairy rim.
Glumes	membranous; unequal, lower 3-nerved, upper 5-nerved, both shortly awned.	unequal, 3–5-nerved, acute or acuminate.	unequal, 3-nerved, lower half as long a spikelet or shorter; upper as long as spikelet.
Lower floret ...	♂ ♀ ☿ or barren	♂ or barren.	♂ or barren.
Lemma	similar to upper glume, membranous, 5-nerved, often with a considerable awn.	similar to upper glume, membranous, 3–7-nerved, not awned.	similar to upper gl but as long as spikelet, 3-nerved.
Palea	membranous, 2-keeled, 2-auricled at base.	membranous, 2-keeled, shorter or as long as the lemma.	much shorter than lemma, 2-keeled.
Upper floret ...	☿; callus rounded, bearded at sides.	☿; callus short rounded, usually bearded.	☿; callus truncat obtuse, bearded.
Lemma	becoming coriaceous, brown, glabrous or hairy, 2-lobed with aristate lobes, with two thick tufts of hair at the base of the lobes near the margins; awn from between lobes with a flat twisted column; dorsal surface thickly pilose or glabrescent.	membranous, becoming coriaceous, scabrid or scaberulous, not bearded or hairy, rarely 2-lobed at apex, the lobes bearing bristles; unawned or awned between the lobes but column of awn not markedly flat.	membranous, fi thinly coriaceous, lobed with lobes longed into bri pubescent or glab but with a sub-mar tuft of hair on each about the mi awned from bet the lobes.
Palea	membranous, oblanceolate, 2-toothed, 2-keeled, covered on adaxial surface with 1-celled hairs which are normal below but very thick above.	narrow, 2-keeled with flaps more or less auricled.	membranous, 2-ke 2-nerved, narro winged but wit appendages.
Lodicules	2 small, cuneate.	2, cuneate.	2, cuneate.
Stamens	3	3	2
Hilum	punctiform	punctiform	linear
Scutellum ...	half grain	half grain or longer.	over half as long a grain.
Panicle	compact panicle	open or contracted panicles.	loose or contracted icles.
Habit	annual	perennials or annuals.	annuals or perenni

Characteristics of the non-Indian genera taken from C. E. Hubbard's account of this

GENERA OF ARUNDINELLEAE

anthoniopsis *Stapf*	**Loudetia** *Hochst.*	**Tristachya** *Nees*	**Gilgiochloa** *Pilger*
ge of hairs	hairy rim.	fringe of hairs.	fringe of hairs.
qual, 3–5-nerved, lower the smaller, upper as long as the elet.	unequal, 3–(rarely 5–) nerved ; lower about a fourth or three-fourths the length of the spikelet, the upper as long as the spikelet.	unequal or subequal chartaceous to coriaceous 3- rarely 5-nerved, not awned.	lower glume about half the length of the spikelet, long-awned; upper glume the length of the spikelet, both 3-nerved.
♂	♂ or barren.	♂	barren
ilar to the upper me, 5–9-nerved.	somewhat similar to upper glume.	similar to upper glume, 3–7-(rarely 9-) nerved.	membranous as long as the spikelet 3–5-nerved.
row, 2-keeled; keels ged.	shorter than lemma, 2-keeled.	membranous, 2-keeled.	becoming rigid woody, yellow, elliptic acuminate.
callus obtuse, 2-thed or truncate, rded.	♀ ; callus blunt, pungent, emarginate or 2-toothed, bearded.	♀ ; callus obtuse, 2-toothed, truncate or pungent, densely bearded.	♀ ; callus short, obtuse, bearded.
mbranous to coriaous, 7–9-nerved, deep-bifid, lobes acute and metimes produced o bristles, bearded on back below the es or with tufts of ir, awned from the us.	lemma pilose, pubescent to glabrescent, shortly 2-lobed, awned between the lobes.	becoming coriaceous, glabrous or more often hairy, 2-lobed, with or without a bristle, awned between lobes.	becoming coriaceous, acutely 2-lobed, with the lobes aristate with tufts of hair at the base of the lobes near the margins ; awned between lobes ; column of awn flat, twisted.
rrow, 2-keeled, nged on the keels ; ngs with an appende at the apex.	as long as lemma, 2-keeled, grooved between keels, keels without wings or appendages.	2-keeled, with keels thickened and approximate, unwinged, without appendages.	becoming indurated, especially on the keels.
cuneate, fleshy.	2, linear or cuneate.	2, narrow, fleshy.	2, small, cuneate.
3	2, rarely 3.	2–3	3
ear	linear	linear, elongate.	narrowly oblong or linear.
lf the length of the ain.	large	large, half grain or more.	half as long as the grain.
ikelets paired or in ree's in open or conacted panicles.	spikelets in three's at the ends of the branches of a panicle.	spikelets in three's at the ends of the branches of a panicle.	dense spikelike panicle.
rennials	perennials or rarely annuals.	perennial, rarely annual.	annual.

the Flora of Tropical Africa 10, Pt. I (1937).

certainly not to be found in any of the genera in the *Arundinelleae* known to me.

It is interesting to note that Griffith [Notulae **3,** 56 (1851)], with the primitive means at his disposal, had observed these extraordinary structures and described them in the following words, " (palea) interior plana, apicem versus dilatata, integra, bivenia, intervenio piloso, pilis inferioribus parvis, summis maximis cellulos referentibus divaricatis, apice ciliata ". The palea and its hairy covering is rather crudely depicted in plate 146, III, of Icones Plantarum Asiaticarum. The extraordinary features of the palea seem to have been missed by later botanists.

I propose to call the new genus *Jansenella* in honour of Dr. P. Jansen, the well known Dutch agrostologist, who has for many years devoted himself not only to a study of the native and adventitious grasses of his homeland, but in recent years has also made important contributions to our knowledge of Malaysian grasses.

Jansenella *Bor*

Genus novum tribus *Arundinellearum*, *Arundinellae* Raddi et *Danthoniopsidi* Stapf affine sed ab illo anthoecii superioris lemmatis loborum basibus dense barbatis et ab hoc hilo punctiforme haud lineare distinctum.

Spiculae lanceolatae, pedicellatae dense paniculatae biflores ; rhachilla infra lemma utrumque disarticulans, glabra, ultra anthoecium superius haud producta. Anthoecia duo, heteromorpha vel homomorpha. Glumae persistentes, membranaceae, 3–5-nerves, breve aristatae, glabrae vel sparsis pilis e tuberculis ortis instructae, virescentes, inaequales. *Anthoecium inferius* ♀, ♂, ☿ vel neutrum ; *lemma* glumae superiori simillimum, 5-nerve, aristatum ; ejus palea bicarinata, anguste alata, alis scaberula, hyalina, glabra ; *stamina* 3 ; *antherae* lineares ; *ovarium* saepe vestigiale, interdum fertile, eo anthoecii superioris simile. *Anthoecium superius* ☿ ; *lemma* chartaceum demum coriaceum, pallidum vel demum pallide castaneum, glabrescens vel dorso pilis longis instructum, fere ad medium bifidum, lobis acutis aristatis, loborum basi dense barbatum, inter lobos aristatum ; *arista* geniculata ; aristae *columna* brunneo-castanea, applanata, valide torta ; *seta* scabra ; *palea* oblongo-lanceolata, bicarinata, carinis anguste alata, inter carinas pilosa, pilis inferne gracilibus acuminatis sed apicem versus crassescentibus demum dactiliformibus apicibus rotundatis instructa ; *stamina* 3 ; *antherae* lineares ; *ovarium* cylindricum ; *styli* duo ; *stigmata* plumosa ; *caryopsis* oblonga, glabra ; *hilum* punctiforme ; *lodiculae* 2, minutae, cuneatae.

Gramina annua culmis erectis ramosis ; foliorum laminae planae ; ligulae membranaceae, angustae.

Species adhuc unica, palustrium incola.

Jansenella griffithiana (C. Muell.) Bor

1, Plant × 1 ; 2, base of leaf showing the arch-shaped ligule × 6 ; 3, abaxial view showing mode of attachment of leaf × 6 ; 4, lower glume × 8 ; 5, upper glume × 8 ; 6, lower lemma × 8 ; 7, lower palea, adaxial and abaxial views × 8 ; 8, lodicules × 8 ; 9, flower × 8 ; 10, upper lemma × 8 ; 11, upper palea, adaxial surface × 30 ; 12, grain showing embryo and hilum × 15.

12
2
9
8
7
3
6
1
5
4
10
11

Jansenella griffithiana (*C. Muell.*) *Bor*, comb. nov.

Danthonia griffithiana C. Muell. in Bot. Zeit. **14,** 346 (1856).

Arundinella avenacea Munro ex Thw., Enum. Pl. Zeyl. 362 (1864).

A. campbelliana Lisboa in Journ. Bomb. Nat. Hist. Soc. **5,** 346 (1891).

Avena malabarica Heyne ex Hook. f., Flor. Brit. Ind. **7,** 69, (1896) nomen.

Arundinella griffithiana (C. Muell.) Bor in Ind. For. Rec. Bot. 73 (1939).

Danthoniopsis griffithiana (C. Muell.) Bor in Flor. Assam, **5,** 187 (1940).

A weak annual straggling grass, growing in dense masses. Culms up to 30 cm. tall, often decumbent and branching at the base and then rooting at the nodes, often erect upon stilt-roots and supported by adjacent stems, smooth and glabrous, striate below, but rather coarsely hirsute below the panicle, glabrous at the nodes. Leaf-blades lanceolate-to ovate-acuminate, ending in a sharp scabrid point, dark green above, glaucous below, with the plane of the leaf at an angle to the sheath so that the junction forms an arch, with rather thick, scabrid margins, with veins very prominent on the upper surface, quite inconspicuous below, with a few scattered hairs on the surfaces above and below at the base, and some on the rounded base, up to 6 cm. long, 14 mm. wide, often flaccid, sometimes stiff ; *sheaths* rather loose, markedly striate, ciliate on the margins ; *ligule* membranous, very narrow, arch-shaped, minutely ciliate.

Inflorescence a compact panicle of crowded spikelets, often in pairs, one short- and one long-pedicelled, seated on the flattened scabrid hirsute branches and branchlets. *Spikelets* about 6 9 mm. long including the aristae of the glumes. *Lower glume* about 4–5 mm. long, ovate-acuminate, ending in a short arista, membranous, 3-nerved, with or without a few tubercle-based hairs on or sometimes between the nerves, scabrid on the centre nerve. *Upper glume* length of the spikelet, elliptic-oblong-acuminate, ending in a scabrid arista up to 2 mm. long, 5-nerved, membranous, scabrid on the nerves towards the apex, with or without a few tubercle-based hairs on the dorsal surface. *Lower floret* ♀, ♂, ☿, or barren ; *lemma* 3–5-nerved, obtuse at the tip with the median nerve carried out as a short arista ; *palea* 3 mm. long, elliptic-oblong or oblong-oblanceolate, 2-keeled, very narrowly winged on the keels, auriculate on the flaps at the base ; *stamens* 3 ; *anthers* 0·75–1·75 mm. long ; *ovary*, if present, rudimentary or well developed ; *lodicules* 2, minute, cuneate. *Upper floret* always ☿ ; *lemma* chartaceous to coriaceous, cream or pale chestnut brown at maturity, 2·5–3 mm. long to the base of the awn, deeply bifid, with lobes drawn out into scabrid bristles, pilose on the dorsal surface or glabrescent, with a dense tuft of hair on each side at the base of each lobe, awned in the sinus ; *palea* a little shorter than the lemma, oblong-oblanceolate in shape, 2-keeled, very narrowly winged on the keels, covered on the adaxial surface with hairs which are slender and acute below, but gradually becoming thicker towards the apex until they are thick-walled 1-celled finger-like processes with rounded tips ; *awn* up to 15 mm. long ; *column* 5 mm. long, flat, tightly twisted when dry ; *stamens* 3 ; *anthers* 0·75–1·75 mm. long ; *ovary* glabrous ; *lodicules* 2, minute, cuneate ; *grain* 1·4–1·5 mm. long, 0·75 mm. broad, oblong-obovate, glabrous ; *hilum* punctiform ; *embryo* half the length of the grain.

IND. OR. : Assam ; Khasiya, *Griffith* 6785, and several other gatherings ; Khasiya, 26 Sept. 1867, 1200 m., *C. B. Clarke* 5070 ; Cherra 11 Sept. 1885, 1200 m., *idem* 40376B ; Sohra, 12 Oct. 1872, 1200 m., *idem* 17452D ; Mausmai, 10 Oct. 1886, 1100 m., *idem* 45866D ; Sohra, 22 Oct. 1871, 1200 m. *idem* 15667.

Bombay ; North Kanara, 15 Jan. 1890, Kumberwada, *W. A. Talbot* 2255 ; Mahableshwar *J. C. Lisboa* (type of *A. campbelliana* Lisboa) ; Castle Rock, 600 m., Oct. 1908, *Meebold* 10756 ; Tiger Leap, near Lanavei, Western Ghats, 1 Oct. 1898, *Woodrow* (the collector in a letter mentions the remarkable markings on the pale of glume IV).

Madras ; Herb. Rottl. ; Mysore, Apr. 1900, *Bourne* ; Annamalais, Izerpadi, Nov. 1901, *Bourne* ; Coorg, 1873, *Beddome*—in fields ; Kulhutty Babat, 1800 m., Oct. 1908, *Meebold* 10571 ; Cochin, Kavalay, 900 m., Nov. 1910, *Meebold* 12179 ; Travancore, Peennade, *Rama Rao* 135 ; Nilgiris, Sispara, 2250 m., Nov. 1883, *J. S. Gamble* 13361, Naduvatam 1500 m., Oct. 1886, *J. S. Gamble* 18306 ; S. E. Wynaad, 1200 m., Nov. 1884, *J. S. Gamble* 15449.

Ceylon ; W. Ratnapura, *Thwaites* 3471—in swamps.

The Woody Plants of the Ryukyu Islands

In 1950, when the United States military forces were in control of the Ryukyu Islands, preparations were made for a long-term programme of development of the natural resources of the Islands. The object of this was to assist the inhabitants, who, at that time, were virtually destitute and subsisting on American aid, to become self-supporting. The impact upon the Ryukyu people of the American military administration of the " Washington " plan for their rehabilitation, is the theme of one of the most delightful plays to be seen in London at the present time, namely " The Tea-house of the August Moon ". In this some aspects of the American effort are gently satirised, though there is a vein of seriousness running through the general levity, but one of the characters does become fanatically preoccupied with the introduction of new vegetables to the area where he is posted. That, however, is as near as the play gets towards the " botanical field research project " which *did* form part of the American plan. And it was this " project " which, " fostered and supported by the United States Civil Administration of the Ryukyu Islands (USCAR) as part of the co-operative Scientific Investigations in the Ryukyu Islands Program under the Pacific Science Board, National Academy of Sciences, Washington, D.C.", has resulted in the publication of the book now under review.*

This book was prepared by Dr. Walker of the Smithsonian Institution " to advance the development of the Ryukyu forestry program ", and, as will be evident from what is said below, it is essentially a practical book, meant for use by those engaged in the detailed forestry work ; and it is so designed that the sort of information they require is presented in a form which they should find convenient.

The title " Important Trees " has been broadly interpreted, and the work comprises the woody plants which might prove useful as well as those already known to be of value, while established exotic species are in-

* Egbert H. Walker, Important Trees of the Ryukyu Islands, pp. 1–350, map, and 209 line-drawings (1954).

cluded along with the natives. As a result just over 200 species of trees, shrubs, and bamboos are dealt with. They are arranged taxonomically, and a very practical general key is provided which should enable the user to run most plants down either to family, genus, or species. They key does not cover all the plants treated in the book, an unspecified number of " unimportant ones " being omitted, as are the bamboos, which are keyed separately (by F. A. McClure). For each family there is a general note and key to the genera (if more than one), a short description is given for the more important genera, and there is a key to the species when more than one is included. Then for each species the Japanese and Okinawan (and sometimes also English) names are given, with information arranged under the headings Description, Distribution and Habitat, Wood, Uses, and Notes ; in addition there is an illustration in the form of a line-drawing. Most of the illustrations are from other works (which are indicated), but 33 are new and were drawn from herbarium specimens. The text is in Japanese and English in parallel columns. The descriptions have been kept as short as possible and, so far as is practicable, have been confined to characters visible to the naked eye ; features clearly evident in the illustrations may be omitted from the description. A bibliography, glossary (with illustrations), and indexes round off the volume.

The information given seems accurate, and the keys work well, though in this connexion it must be noted that the general key does not appear to accommodate *Sapium sebiferum* and *Quercus stenophylla* (of the species tested) though neither could properly be regarded as " unimportant " and omitted for that reason. The book has evidently been most carefully prepared, and should prove of value to all interested in the flora and/or economic products of the Far East, and not only to those for whom it was produced.

J. Robert Sealy.

Rock Gardening.*—This little book, which forms No. 12 of the " Amateur Gardening Handbook " series, deals with the subject in a clear and interesting manner, and contains many valuable hints which will hold the reader's interest whatever his experience in rock gardening. Intended as an elementary handbook it gives in 9 chapters the essentials for the beginner and includes a classified list of alpine plants, a selection of plants suitable for special positions, a glossary of specific terms, and is illustrated with line drawings.

H. S. Marshall.

* Rock Gardening. By G. K. Mooney. Pp. 92. ("Amateur Gardening" Handbook Series No. 12) 1955. London : W. H. & L. Collingridge Ltd. Price 3/6.

THE STATUS OF CLATHRUS IN ENGLAND.

R. W. G. Dennis

The status of *Clathrus ruber* Mich. ex Pers. as a British plant is an old problem, recently revived by enquiries from the Isles of Scilly, where the species is now well established in association with planted Veronica hedges. *Clathrus ruber* is certainly native to the Mediterranean region and probably to western France. Numerous scattered records of its occurrence throughout the remainder of western and central Europe are usually interpreted as the result of casual introductions, often with flowering plants of Mediterranean origin. Southern England thus lies on the fringe of the area in which the species is permanently established and believed to be native. The recorded British gatherings are :

Cornwall :

Isles of Scilly, 21.8.1954 J. E. Lousley and known to have been present for several years.

Penzance and Falmouth, no precise information.

Devon :

August 1848. In Mrs. Traver's garden at Torquay, in rich reddish earth, formerly a pine plantation (Mrs. Hussey).

About 1855. Mrs. Griffiths, Torquay.

About 1857. Ashfield, Torquay.

14.6.1867. Ashfield Tor (Science Gossip 1.8.1867).

17.11.1866. Hard earth of a perpendicular bank under trees, Teignmouth (Science Gossip 1.12.1866).

1869. Babbacombe (Herb. Berkeley).

1928. " Occurs occasionally at Torquay " (Tr. Dev. Ass. Av. Sci. 60 p. 88).

6.7.1954. Under elms in a garden, Combe Martin, north Devon, said to have been present for several years.

Dorset :

Prior to 1871. Lyme Regis. (M. C. Cooke).

Somerset :

August 1947. In a garden, Martock.

Isle of Wight :

1844. In a copse at Appley near Ryde, Dr. Broomfield (Sic) and Mr. Kippist. Martin (1849) added "Occasionally found in damp pasture grounds at Old Park, in Pelham Woods and at Steephill ".

Sept. 1917. In a wood near Seaview (Tr. Brit. Myc. Soc. **6** p. 1).

About 1917. Hedgebank at Adgestone (Swanton).

Sept. 1920. " Isle of Wight " (Tr. Brit. Myc. Soc. **7** p. 3).

1922. Nettlestone (Swanton).

Mainland of Hampshire :

Prior to 1889. Pine woods at Bournemouth. (Massee).

21.8.1920. Alverstoke.

Sussex :

5.9.1952. A garden, Bexhill on Sea.

Kent :

27.9.1945. Eltham. Also an undated record from Bromley.

Surrey :
1896 and 1933. Haslemere.

Hertfordshire :
1945. A garden, Bushey Heath.

Berkshire :
Prior to 1889. Windsor (Massee).

Essex :
One vague record, undated.

Norfolk :
20.10.1859. On a bank covered by moss and bracken, Mintlyn Wood, Kings Lynn.

Scotland :
1881. Tynninghame, East Lothian.
10.9.1917. In a flower border, Kilmelford, Argyll. (Paul).

From the above list the tendency for the records to be clustered along the south coast of England is at once obvious. There is also an apparent tendency for records to occur in groups separated by a considerable gap in time. There is a large group prior to 1870, another in the second decade of the present century and a third from 1945 onwards. This irregular distribution in time may merely reflect the inadequacy of the record but there is evidence from other sources that fungi with a predominantly southern distribution lost ground in England towards the end of the nineteenth century. Thus, *Uredo quercus* (Brond.) Duby seems to have been plentiful in south-east England from Norfolk to Wiltshire from about 1840–1870 but it is now known only in a few localities on the south coast and in the Channel islands. It is also possibly noteworthy that the revival of *Clathrus* in the present century coincided with war periods when fresh introductions may have taken place from overseas.

Nearly all the records are from gardens or pleasure grounds except those from Isle of Wight, Bournemouth and Kings Lynn and the fungus has tended to recur in very few localities viz. the Torquay district, the Isle of Wight and, of recent years, the Isles of Scilly. The Kings Lynn occurrence is of particular interest because it sounds like a possible native station yet there has been no word of the species from Norfolk since 1859. From information kindly supplied through Mr. Swann of Kings Lynn by Mr. H. L. Bradfer-Lawrence, the present proprietor of Mintlyn Wood, it appears the old highway to Norfolk traversed the wood until a turnpike road was made to the south about 1750. Extensive planting took place in the vicinity about 1790–1820, including a number of specimen trees of foreign origin and Rhododendrons were planted in the wood between 1850 and 1890. Evidently Mintlyn Wood had been extensively disturbed and the vegetation modified by introduction of aliens before the *Clathrus* appeared there. It may be noted also that this must have been a much frequented locality prior to the Grayswood Enclosure Award of 1810, so that had such a distinctive plant then occurred in Mintlyn Wood there was every opportunity for it to come to the notice of Sowerby or other of the late 18th century naturalists.

Before pronouncing on the status of *Clathrus* in the Isle of Wight and south Devon it will be well to summarise the circumstances under which it occurs in its native countries of the western Mediterranean, where it is plentiful in North Africa, Andalusia, Valencia, Catalonia, the Balearic islands, Corsica, Provence and Gascony. In this region it is found in forests of *Quercus ilex*, *Q. lanuginosa* and *Pinus spp.*, usually attached by its mycelial strands to rotting roots or buried wood. In a casual occurrence in a kitchen garden at St. Germain Lespinasse on the upper Loire the strands were traced to stakes of coniferous wood. Round Toulouse it occurs in woods in autumn, after the first rains, on dry banks and in low, shady, damp places alike. Growth is evidently encouraged by decaying organic matter for Roumeguère recorded it surrounding the very decayed carcase of a dog in a wooded ravine at Auffrey and at the foot of a *Jubaea* palm recently treated with horse manure at Collioure in April 1873. One of the casual occurrences in Belgium was on manure heaps, August 1889.

It seems to be generally accepted that *Clathrus* is native also in stations up the west coast of France to Bretagne, where the Crouans in 1867 recorded it as occurring on " talus des champs et terrain de transition ". According to Lami (1942) it is common on banks and under hedges in south Brittany but not on the north coast, where he noted a single occurrence on roadside waste near Dinard in autumn 1937. Madame Le Gal kindly informs me that she has collected it under a field hedge near Redon, between Rennes and St. Nazaire.

All stations north and east of this appear to be in gardens and sometimes there is clear evidence of introduction with Mediterranean plants e.g. in 1866 on *Arundo donax* from Hyères planted in a garden in the environs of Paris. A record from Nogent, 1930, was from the garden of the Institut national d'Agronomie coloniale. Even in Canton Ticino, southern Switzerland, Benzoni (1948) classed *Clathrus* as an exotic, associated mainly with planted bamboo. The only exception to this rule is a vague statement in Bul. Soc. mycol. France, 1928, where we are told that M. Granpierre collected *Clathrus* at the side of a footpath in the Bois d'Autricourt, Ardennes, where it appeared not to have been imported. This is reminiscent of the Kings Lynn occurrence and is perhaps to be accounted for in a similar way. In this connection one may cite for comparison the naturalisation in Alsace and Cote d'Or of another phalloid, *Anthurus aseroeformis*, which is said to have become completely established there during the last quarter century. Chifflet and Des Gayets (1911) reviewed the known occurrences of *Clathrus* in the Departments of Rhône and Loire, commented that these were all in private grounds and concluded that the fungus was not native in any of them. The most interesting for comparison with the British stations was one at Pierre-Bénite, October 1900, at the foot of an oak, associated with *Ruscus aculeatus* and *Arum italicum*, in a garden.

The most easterly French station on the channel coast in which *Clathrus* is claimed to be native is that at Léz-Eaux, Saint Pair, near Granville. Here it is said to have occurred in clusters each year from 1900–1922, mainly in shrubberies of Euonymus, bamboo and laurel but also in shaded turf and in the debris between ivy stems and the oak trunk up which they were climbing. Between 15th June and the end of September

1922 Potier de la Varde counted 150 fructifications in this locality. Though the fungus is associated largely with introduced plants it is evidently firmly established there and the environs of Granville may be accepted as the northern limit of its normal range in France. There are two records with only meagre data from Le Havre but exotic plants may

Fig. 1. Distribution of *Clathrus ruber* in western Europe.

be expected to occur sporadically in the vicinity of a great port. (Maury 1932). In Guernsey *Clathrus* occurred in a garden for several years prior to 1901. The stations in Belgium and Holland clearly represent casual introductions, the species was reported only once from each country during the nineteenth century. In the map, Fig. 1, the heavy wavy line

approximately indicates a demarcation between native stations to the south and west and casual introductions to the north and east.

From the available evidence one could adopt one of three possible interpretations of the status of this plant in England viz :

(1) That it is a native of south and south-east England, fairly widespread in the first half of the last century, with its range greatly contracted at the end of the century and expanding again of recent years. The chief support for this view would lie in the early occurrence at Kings Lynn, to which in the writer's opinion little weight can be attached for the reasons explained above.

(2) That it is native in the two districts where it has recurred for a century i.e. the Isle of Wight and south-east Devon. Such a distribution is comparable with that of *Arum neglectum*, a species only critically separated from *A. italicum* with which *Clathrus* grew at Pierre-Bénite. The habitats cited for the Isle of Wight, copses, hedge banks and damp pastures are clearly comparable to those in which the fungus is accepted as native in Gascony and Bretagne. But Martin, who cited the early occurrences in the Isle of Wight also stressed the success obtained in planting exotic shrubs in the island so that there must have been ample opportunity for introduction of the *Clathrus* mycelium from overseas before his day.

(3) That it is an alien, introduced to the Isle of Wight and South Devon about 1840, naturalised there and in Cornwall and occurring as a casual elsewhere. The general pattern of distribution in England is hardly that to be expected of a Mediterranean plant having the limit of its natural range there and it is odd that there are no clearly substantiated records from southern Ireland. On the other hand there are none from botanic gardens in England, where one might expect an exotic species to appear from time to time. *Clathrus* " eggs " travel well and would easily survive a week's journey with reasonably careful handling, so that they could well have been sent from south Devon or the Isle of Wight to London naturalists in the seventeenth or eighteenth centuries. It is, indeed, hard to believe that such a remarkable and brightly coloured species could have escaped the notice of British botanists until 1840 had it been present in the country long prior to that date. In his History of Devonshire, 1797, Polwhele comments on the presence there of the " Stinking Morel ", *Phallus impudicus* and he would surely have seen or heard of the still more remarkable *Clathrus ruber* had it grown round Torquay in his day. He and his comperes would have found no difficulty in recognising the plant for it had been well figured for English readers by Parkinson in Theatrum Botanicum as long ago as 1640, under the name " Fungus Coralloides cancellatus Clusii sive Lupi crepitus efflorescens Columnae. A deadly stinking Mushrome, though finely branched."

Though it is supported largely by negative evidence this third alternative of introduction and naturalisation in the early nineteenth century seems the best explanation of the occurrence of *Clathrus ruber* in England.

The writer is indebted to Mr. F. A. Brokenshire for communicating details of the Combe Martin station, to Dr. R. L. Steyaert for unpublished records of *Clathrus* in Belgium, and to Madame Le Gal for unpublished information about its status in Bretagne.

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Origin of the British Flora.*—The author has provided a simple and attractive account of the principal features concerning the history and distribution of the British Flora in which the emphasis on its vicissitudes with the passage of time and the changes in area are, perhaps, the most interesting aspects dealt with.

The author adopts a wisely cautious attitude towards possible perglacial survival. Even where there is evidence of nunataks, it is important to appreciate that even the probability of no appreciable covering of ice by no means necessarily implies conditions favourable to regenerative continuity.

This work constitutes a botanical presentation of the geography of the British Flora in time and space that should be useful alike to the student and the amateur. An appendix furnishes lists of the more restricted geographical elements with the exception of the endemics.

E.J.S.

* Origin and Distribution of the British Flora, by J. R. Matthews, Hutchinson's University Library, price 8s. 6d.

NEW OR INTERESTING QUEENSLAND AGARICALES.

R. W. G. Dennis

Because ephemeral characters bulk so largely in agaric diagnosis it is seldom possible to determine dried collections of these fungi with confidence or to describe them precisely enough for the species to be recognised by later collectors. In a parcel of dried fungi recently received from Mr. J. E. C. Aberdeen of Brisbane, however, there are a few collections which have sufficiently diagnostic anatomical features or distinctive colouring to provide the bases for reasonably adequate descriptions. They are accompanied by field notes and rough water-colour drawings which have been matched as far as possible with Ridgway's colour standards. The colours quoted below depend on the accuracy of the original drawings by Mr. Aberdeen. Of the four species described, three are allied to european or north american plants but appear distinct enough to warrant specific or varietal rank, at least until intermediate forms come to hand. The fourth is a european fungus not previously received from Australia.

Mycena leaiana (*Berk.*) *Sacc.* var. **australis** var. nov. ; a typo differt pileo avellaneo. Ad truncos vetustos putrescentes arborum, caespitosa fasciculata. Pileus hemisphaericus, 1-1·5 cm. latus, viscidus, avellaneus (avellaneous to wood-brown, Ridgway), striatus. Stipes fistulosus, aequalis, 2·5 3 cm. longus, 1–1·5 mm. crassus, glaber, viscidus, pallide aurantiacus. Lamellae subdistantes, 3–4 mm. latae, dente decurrentes, aurantiacae (salmon orange, Ridgway), acie gelatinosa. Sporae hyalinae 7–9 × 4–4·5μ, amyloideae. Pleurocystidia fusoidea, 45 × 8–11μ ; cheilocystidia filamentosa vel clavata, 5μ crassa et nodulosa vel digitata.

Binna Burra, Lamington, Queensland, 2.6.1953, *J. E. C. Aberdeen* 119 (Typus).

This fungus clearly belongs to the section Glutinipedes, subsection Caespitosae A. H. Smith and, like its allies, has a broad gelatinised zone of slender loosely woven hyphae between the pseudoamyloid trama and the thin subhymenium (Fig. 1). In everything but colour it closely resembles *M. leaiana*, a species known only from the eastern parts of north America, North Carolina and Tennessee to Nova Scotia and Ontario. Smith (1947) had not found it on the Pacific coast. In view of this wide geographical separation and an apparent difference in colour of pileus it seems best to propose a new varietal name for the Australian fungus.

Cortinarius (**Dermocybe**) **erythrocephalus** *Dennis* spec. nov. ; pileus obscure sanguineus, carnosus, tenuis, e convexo planus, 2·5 cm. latus, sericeus ; cortina araneosa, fugax, rubra. Stipes 6 cm. longus, 8 mm. crassus, farctus, pallide coccineus (coral red to light coral red, Ridgway), passim flexuosus, basi incrassatus, concolori-fibrillosus. Lamellae adnatae, confertae, 3 mm. latae, obscure sanguineae. Caro coccinea, in stipite aurantio-lutea. Sporae ferrugineae, subglobosae, punctatae, 7–7·5 × 5·5–6μ.

Inter folia decidua in silvis, Binna Burra, Queensland, 3.6.1953, *J. E. C. Aberdeen* 138 (Typus).

As regards colouring this species resembles *C. sanguineus* (Fr.) Fr. in the pileus and *C. cinnabarinus* Fr. in the stipe. It differs from both in its subglobose spores, orange pith and orange mycelium. The collector could detect no distinctive odour, whereas both the european species have a raphanoid smell, but this is a detail which should be checked by future collectors. The tramal sap turns violet in KOH solution.

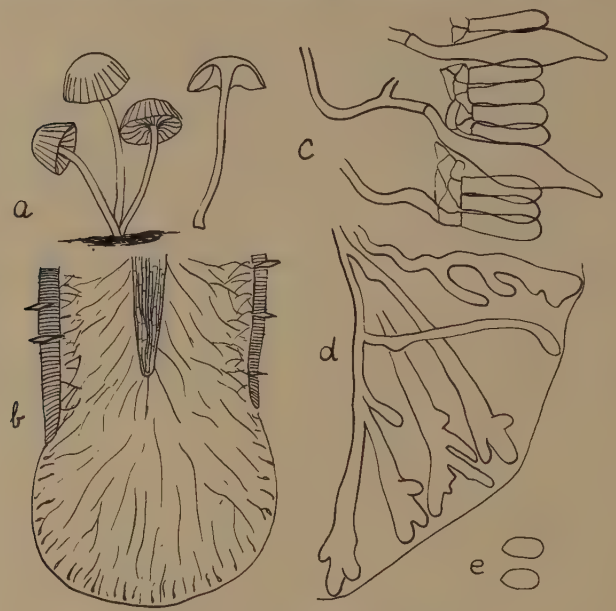

FIG. 1. *Mycena leaiana* var. *australis*.

(a) Carpophores and section, natural size. (b) Transverse section of gill edge × 100. (c) Hymenium with pleurocystidia. (d) Cheilocystidia. (e) Spores × 660.

Naucoria centunculus (*Fr.*) *Kummer*.

The occurrence of this european species as an apparently native plant in Queensland is sufficiently remarkable to warrant a brief description of the collection on which the record is based.

Carpophores gregarous but not caespitose, on rotting logs. Pileus grey-brown, 2 cm. across, flat or depressed, pruinose ; flesh thin, brown ; stipe up to 2 cm. × 2 mm., with a whitish pruina, solid; lamellae moderately spaced, adnate, whitish to straw-coloured, with a minutely crenate white margin. Spores very light brown, broadly ovoid to subreniform, without a germ pore, 6·5-9·5 × 5–6μ, thinwalled, smooth. Cheilocystidia clavate, 35-45 × 12-15μ, caulocystidia similar ; pileus surface covered with erect clavate hairs 30 × 7–10μ. (Fig. 2).

Binna Burra, Lamington, Queensland, 1.6.1953, *J. E. C. Aberdeen* 115.

Hypholoma subdispersum *Dennis*, spec. nov. ; ad ligna mucida in terra dejecta in nemoribus humidis, caespitosum, fasciculatum. Pileus

carnosulus, e campanulato convexus, 1–2·5 cm. latus, laevis e velo circa marginem superficiali-sericeus, aurantio-brunneus (orange-cinnamon Ridgway) sed circa marginem pallide luteus (ivory yellow Ridgway). Stipes cavus, aequalis, 1·5–4 cm. longus, 1·5–3 mm. crassus, pallide luteus, apice albus. Lamellae adnatae, confertae, angustae, primo alboflavae demum olivaceo-brunneae. Caro tenuis, sapore amaro. Sporae fusco-purpureae, ovoideae, 6·5–7·5 × 4–5μ.

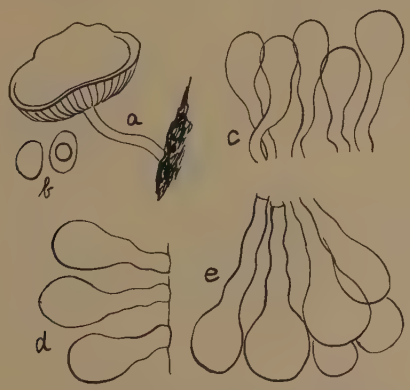

FIG. 2. *Naucoria centunculus* from Aberdeen 115.

(a) Carpophore, natural size. (b) Spores. (c) Downy hairs of the pileus. (d) Hairs of the stipe. (e) Cheilocystidia × 660.

Binna Burra, Lamington, Queensland, 1.6.1953, *J. E. C. Aberdeen* 116 (Typus).

This fungus is close to *H. janus* (Berk. & Br.) Petch, of Ceylon, and would have been so determined had not Petch clearly stated that *H. janus* has no bitter flavour. Of european species it most resembles *H. dispersum* (Fr.) Quél., which has slightly larger spores and usually solitary carpophores. The spores are like those of *H. fasciculare* (Huds. ex Fr.) Kummer but the carpophores differ markedly from that species both in colour and stature. Dennis, Wakefield and Bisby (1954) have explained that the International Code of Botanical Nomenclature requires the adoption of *Hypholoma* (Fr.) Kummer rather than *Nematoloma* Karst. for the genus typified by *Agaricus sublateritius* Fr.

Mr. Aberdeen's collection includes also the following species already known from Australia :

Hygrophorus (*Camarophyllus*) *niveus* Fr. damp bank beside track, Binna Burra 1.6.1953.

Kuehneromyces mutabilis (Schaeff. ex Fr.) Singer & Smith, on rotting logs, Binna Burra 2.6.195 . Singer & Smith had this species from Java and Cooke listed it from Australia.

Amanita vaginata (Bull. ex Fr.) Kummer, on the ground in open eucalypt forest with Lantana clumps, Moggill, 4.2.1954.

Collybia tortipes Cleland, forming fairy rings on lawn, University of Queensland, Brisbane, 2.2.1954.

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Gardening in Malaya.*—This handbook on gardening is concerned with the lowland regions of Malaya and is based largely on the author's 30 years' experience of living in Singapore. Prof. R. E. Holttum was Director of the Singapore Botanic Gardens for 24 years and is therefore eminently qualified to write this work.

There are 15 chapters (with an index) devoted to all practical aspects of gardening in Malaya, covering the special problems which the rather uniform climate there involves. The first 4 chapters deal with general topics concerning climate, garden-planning, soils, composting, manuring, propagation and pruning. The rest of the book is largely devoted to short descriptions and practical notes on plants suitable for cultivation. The plants are grouped under the following headings : Herbaceous Plants and Dwarf Shrubs ; Ornamental Shrubs and Climbers ; Hedges ; Trees and Palms ; Lawns ; Foliage Pot Plants ; Orchids ; Rock and Water Gardens ; Vegetables ; Fruit and Fruit Trees. This list illustrates the wide scope of the book. The plants themselves are listed under the botanical name, usually the genus only is given or under the common name (English or local vernacular) if that is better known. A great number of the plants mentioned in the text are illustrated by good line-drawings which adequately convey to the reader the general characters, such as flowers and foliage.

The chapter devoted to orchids and the references to ferns have the authority of Prof. Holttum's special interest in those groups. Hybrid orchids, of which so many have been raised in Singapore, are illustrated in 4 of the coloured plates.

The final chapter is devoted to pests and diseases with information on how to deal with them.

This attractive book with its line-drawings, black and white as well as coloured photographic illustrations is clearly written and with its comprehensive treatment of the subject will be of the greatest value to all those interested in gardening in Malaya.

L. L. Forman.

* Gardening in the Lowlands of Malaya by R. E. Holttum. The Straits Times Press, Ltd., Singapore. 1953. pp. 323, 17 uncol. and 8 col. illustr., numerous black and white line drawings. $12.5 (Malay).

THE LARGER FUNGI IN THE NORTH-WEST HIGHLANDS OF SCOTLAND.

R. W. G. Dennis

One of the difficulties in ecological studies on the larger British fungi lies in the highly artificial character of their environment. It is on this account that the habitat of so many species has been recorded simply as " mixed woods " and in a mixed planting it is indeed often very difficult to discover with which species of tree a particular fungus is associated. Hence there are distinct advantages in collecting " on the fringe of the world and its wilderness " where there has been a minimum of planting and where the phanerogamic associations, though not entirely undisturbed, are relatively few and well defined. Since 1946 the writer has made numerous collections of the larger fungi in the north-west highlands of Scotland both in the native birch woods and the open moors, with supplementary collections in the small and well defined plantations of conifers and other trees. This is a region beyond the range of native oak, beech, ash or pine woods so that the problem of associating a terrestrial fungus with its appropriate tree is greatly simplified as far as the native woodlands are concerned.

Fungi of Birch Woods.

Very little information is available regarding the fungus components of British Highland birch woods and not a great deal about those of continental Europe. From birch woods of Glen Tilt, Perthshire, White (1879) recorded *Amanita vaginata*, *Mycena pura*, *Hypholoma fasciculare*, *Armillaria mellea*, *Hygrocybe chlorophana*, *H. nitrata*, *Russula rubra*, *R. cyanoxantha*, *R. foetens*, *Lactarius blennius*, *L. subdulcis*, *Paxillus involutus*, *Leccinum scabrum*, *Cantharellus cibarius*, *Polystictus versicolor*, *Polyporus betulinus* and " *P. nigricans* " by which last he presumably meant *Fomes fomentarius*. Of these the Hygrophori are rather pasture species which penetrate the open and lightly shaded birch woods and only *Leccinum scabrum*, *Polyporus betulinus* and *Fomes fomentarius* can be regarded as peculiar to birch. The first is believed to be a component of birch mycorrhiza, the others are parasites confined to this tree.

In the birch woods on peat deposits in the Jura Favre (1948) found about 100 species of the larger fungi, of which the most abundant were, in order of frequency : *Leccinum scabrum*, *Lactarius glyciosmus*, *Russula claroflava*, *Cortinarius armillatus*, *Russula venosa*, *Paxillus involutus*, *Entoloma nidorosum*, *Lactarius pubescens*, *L. uvidus*, *L. vietus*, *Russula versicolor*, *Cortinarius hemitrichus*, *Mycena galericulata*, *Cortinarius anomalus* and *Tricholoma fulvum*. Favre's observations on the species in the Jura are quoted in the annotated list of Highland birch wood fungi given below.

The north-west Highland woods are of particular interest also as being the nearest in Europe to the very isolated birch woods of Iceland. Unfortunately the fungi of the latter have not been studied by modern methods and one has to rely for them on work of Larsen (1931) which does not inspire a great deal of confidence, particularly in such critical genera as *Russula* and *Cortinarius*. Nevertheless as birches and willows are Iceland's only native trees the list of birchwood fungi is of considerable

interest. Larsen recorded : *Dacrymyces deliquescens*, *Exidia albida*, *E. repanda*, *Tremella lutescens*, *Clavaria cinerea*, *Thelephora terrestris*, *Tomentella ferruginea*, *Corticium granulatum*, *Stereum vorticosum*, *S. hirsutum*, *S. rugosum*, *S. tuberculosum*, *Radulum orbiculare*, *Phlebia radiata*, *Merulius corium*, *Polyporus brumalis*, *P. croceus*, *Polystictus hirsutus*, *Clitocybe odora*, *C. tornata*, *Lyophyllum conglobatum*, *Resupinatus applicatus*, *Melanoleuca cognata* var., *Entoloma rhodopolium*, *Hebeloma crustuliniforme*, *H. fastibile*, *H. hiemale* ?, *H. mesophaeum*, *Inocybe dulcamara*, *I. caesariata*, *I. decipiens*, *I. grammata*, *Cortinarius tortuosus*, *C. decipiens*, *C. incisus*, *C. hemitrichus*, *C. flexipes*, *C. rigidus*, *C. gentilis*, *C. biformis*, *C. helvolus*, *C. bulbosus*, *C. anomalus*, *C. bulliardii*, *C. porphyropus*, *C. latus*, *Amanita vaginata* var. *fulva*, *Pholiotina togularis*, *Agrocybe praecox*, *Kuehneromyces mutabilis*, *Pholiota alnicola*, *Stropharia coronilla*, *Psathyrella spadiceogrisea*, *P. gossypina*, *Lactarius tabidus*, *L. glyciosmus*, *L. lilacinus*, *L. uvidus*, *L. torminosus*, *Russula delica*, *R. graminicolor*, *R. lilacea*, *R. vinosa*, *R. grisea*, *R. ochracea*, *R. decolorans*, *R. nauceosa*, *R. queletii*, *Leccinum scabrum*, *Suillus piperatus*.

This list has several surprising features such as the large number of Cortinarii but the most arresting is the absence from it of the two parasitic polypores *P. betulinus* and *Fomes fomentarius*. Larsen's *Polystictus hirsutus* is surely *P. versicolor*. *Exidia repanda* is a northern species found in Iceland and north Europe but so far known in Britain only from the northwest Highland birch woods. Several of the species ascribed to birch woods by Larsen occur in Scotland rather in open grassland and will be found in the appropriate list below.

In Sutherland beyond the range of oak and pine the writer's collections have been made in the following apparently native woods :

Rocky slope north of Borgie Bridge.

Beside the Kyle between Tongue and Kinloch.

Sheltered slopes of Ben Loyal and up to 1,500 ft. on Meallan Liath, E. of Ben Hope.

South end of Loch Shin, with numerous large aspens present.

Loch More-side, with scattered holly, Loch Stack and along the north slopes of hills south of Laxford Bridge.

Crags facing E. at Ardmore on Loch a Chataidh.

No birch wood was seen along Loch Inchard apart from a few scatterred birch, rowan and holly at Rhiconich which yielded nothing of interest. Supplementary records have been added from other birch woods in Shieldaig, Applecross and the Isle of Rhum. These include a number of early-fruiting species obtained in June 1947.

Annotated list from the North-West Highland woods.

Amanita muscaria (L. ex Fr.) Hooker. Tongue, characteristic of birch.

A. rubescens (Fr.) S. F. Gray. Tongue southwards, occurs with birch in the Jura but not peculiar to this tree.

Armillaria mellea (Vahl ex Fr.) Kummer. Tongue southwards, on birch and rowan, ubiquitous.

Cystoderma amianthina (Fr.) Fayod. Tongue southwards, not closely associated with birch.

Tricholoma fulvum (DC) Sacc. Tongue southwards, characteristic of birch woods.

Collybia maculata (A. & S. ex Fr.) Kummer. Loch Torridon ; associated with pine in the Jura.

Laccaria laccata var. *proxima* (Boud.) R. Maire. Tongue southwards, abundant on peat here and in the Jura.

Laccaria amethystea (S. F. Gray) Cooke. Applecross, not characteristic of birch and occurs with planted beech at Tongue.

Mycena filopes (Bull. ex Fr.) Kummer (*M. iodiolens* Lundell). On fallen twigs from Tongue and Borgie Bridge southwards, not confined to birch but with it in the Jura.

M. galericulata (Scop. ex Fr.) Kummer. On birch at Tongue and in the Jura but not peculiar to it elsewhere.

Hemimycena speirea (Fr.) Singer. On twig, possible *Sorbus*, Isle of Rhum.

Lactarius blennius (Fr.) Fr. Ardmore, a brown form approaching *L, circellatus* Fr.

L. camphoratus (Bull. ex Fr.) Fr. Applecross, not habitually with birch.

L. glaucescens Crossl. Tongue.

L. glyciosmus Fr. of British authors (= *L. impolitus* Fr. sensu Kühner & Romagnesi). Tongue southwards, intimately associated with birch, even with *B. nana* in the Jura.

L. insulsus (Fr.) Fr. Applecross ; not in the Jura.

L. necator (Pers. ex Fr.) Karst. Borgie Bridge southwards, very characteristic of British birchwoods but almost confined to *Picea* in the Jura.

L. torminosus (Schaeff. ex Fr.) S. F. Gray. Tongue southwards, characteristic of birch, also in the Jura.

L. vellereus (Fr.) Fr. Loch Maree, more often with beech ; not in the Jura.

L. vietus (Fr.) Fr. Ardmore southwards, characteristic of wet birch woods, also in the Jura.

Russula claroflava Grove. Eigg, characteristic of wet birch woods, also in the Jura.

R. fallax (Fr.) Sacc. Borgie Bridge and Shieldaig ; with conifers in the Jura.

R. foetens Pers. ex Fr. Applecross, not characteristic of birch ; not in the Jura.

R. heterophylla (Fr.) Fr. Tongue southwards, not confined to birch, not in the Jura.

Russula intactior J. Schaeffer. Ardmore.

R. nigricans (Bull. ex Fr.) Fr. Borgie Bridge southwards ; with birch, pine and spruce in the Jura.

R. ochroleuca Pers. ex Fr. Lairg, more often in beech or pine woods.

R. velenovski Melzer & Zvara. Tongue, characteristic of birch but not in the Jura.

Cantharellus cibarius Fr. Borgie Bridge southwards, abundant but not confined to birch.

C. tubaeformis Fr. Tongue, Applecross, not characteristic of birch.

Panus conchatus (Bull. ex Fr.) Fr. On birch, Strathnaver ; not in the Jura.

P. stipticus (Bull. ex Fr.) Fr. On birch stump, Shieldaig ; not in the Jura.

Pluteus cervinus (Schaeff. ex Secr.) Kummer. On birch Eigg, also in the Jura.

Entoloma turbidum (Fr.) Quél. Tongue ; with *Picea* in the Jura.

Nolanea staurospora Bres. Tongue southwards ; common also in the Jura birch woods and in many other associations.

Cortinarius (*Phleg.*) *triumphans* Fr. Loch Torridon, characteristic of birch in the Highlands but not recorded from the Jura bogs.

C. (*Derm.*) *anomalus* (Fr.) Fr. Tongue ; " préférence marquée pour la bétulaie moyennement marécageuse " in the Jura.

C. (*Derm.*) *tabularis* (Fr.) Fr. Applecross ; not in the Jura.

C. (*Tel.*) *hemitrichus* (Pers. ex Fr.) Fr. Tongue southwards ; characteristic of wet birch woods in the Jura.

C. (*Tel.*) *punctatus* (Pers. ex Fr.) Fr. sensu Lange. Tongue ; not in the Jura.

C. (*Tel.*) aff. *stemmatus* Fr. Tongue.

C. (*Hydr.*) *aff. duracinus* Fr. Borgie Bridge.

Inocybe abjecta (Karst.) Sacc. Borgie Bridge, Applecross ; not in the Jura.

I. pyriodora (Pers. ex Fr.) Kummer. Isle of Rhum ; not in the Jura.

I. grammata Quél. Isle of Rhum ; also with birch in the Jura.

Kuehneromyces mutabilis (Schaeff. ex Fr.) Singer & Smith. On birch, Tongue, Loch Maree, on willow in Rhum and other trees elsewhere ; on birch in the Jura.

Hebeloma testaceum (Batsch ex Fr.) Quél. Tongue ; several allied species with birch in the Jura.

H. crustuliniforme (Fr.) Quél. Loch Torridon.

Gymnopilus penetrans (Fr.) Murrill. On fallen twigs, Loch More ; with conifers in the Jura.

Galerina mycenopsis (Fr.) Kühner. Borgie Bridge southwards, not confined to woods ; associated with *Hylocomium schreberi* in pine woods in the Jura.

Paxillus involutus (Batsch ex Fr.) Fr. Tongue southwards, also with birch in the Jura.

Psathyrella gossypina (Bull. ex Fr.) Pearson & Dennis. With fallen twigs, Loch More ; also with birch in the Jura.

P. spintrigera (Fr.) Moser. Borgie Bridge ; not in the Jura.

Hypholoma fasciculare (Huds. ex Fr.) Kummer. Tongue southwards, also on birch in the Jura.

Leccinum scabrum (Bull. ex Fr.) S. F. Gray. Tongue southwards, abundant and intimately associated with birch but fructifications occur up to 15 yards from a tree ; occurs also with *B. nana* in the Jura.

Leccinum testaceo-scabrum (Secr.) Singer. Strathnaver southwards.

Xerocomus subtomentosus (L. ex Fr.) Quél. Tongue southwards, not confined to birch but also occurs with it in the Jura.

Polyporus betulinus Fr. Tongue southwards, abundant and confined to birch ; also in the Jura but apparently not in Iceland.

P. rutilans Fr. On birch, Tongue ; not in the Jura.

P. varius Fr. On birch, Tongue but more often on willows ; on birch in the Jura.

Polystictus versicolor (L. ex Fr.) Fr. On birch, Tongue and in the Jura but also on wood of any kind.

Fomes fomentarius (L. ex Fr.) Karst. On old birches, Tongue ; between Invershin and Lairg ; Loch Maree but much less common than *P. betulinus* ; also in the Jura.

Merulius tremellosus Fr. Tongue ; also on birch in the Jura.

Hydnum repandum Fr. Loch Torridon ; only with conifers in the Jura.

Stereum purpureum (Fr.) Fr. On birch, Loch Shin, on wood of any deciduous tree elsewhere.

S. hirsutum (Fr.) Fr. On birch and alder, Tongue southwards and in the Jura.

S. rugosum (Fr.) Fr. On rowan, Laxford Bridge ; on alder, Tongue ; not in the Jura.

Grandinia farinacea (Fr.) Bourd. & Galz. On Aspen, Lairg.

Peniophora hydnoides Cke. & Massee. On birch, Isle of Rhum ; on aspen, Lairg.

Corticium comedens Fr. On birch, Tongue.

Clavaria rugosa Fr. Borgie Bridge, more often with conifers as in the Jura.

Solenia poriaeformis Fr. On aspen, Lairg.

Tremella foliacea Fr. On rowan, Loch More.

Exidia repanda Fr. Shieldaig, a vernal species ; also on birch in the Jura.

Calocera cornea (Fr.) Loudon. Tongue southwards.

Dacrmyces deliquescens (Bull. ex Mérat) Duby. Tongue southwards.

In the woodlands cited above *Betula pubescens* is the dominant tree. It is always associated with scattered rowans, *Sorbus aucuparia*, but the brown *Lactarius* referred in the list to a form of *L. blennius* is the only basidiomycete which may possibly be closely associated with these. Aspen, *Populus tremula*, occurs in the woods from Ardmore and Loch Shin southwards but its presence had no observed effect on the agaric flora nor were any species found to be particularly associated with the holly, *Ilex aquifolium*, of Loch More. A solitary old holly tree stands among the rocks beside the waterfall of the Garbh Allt on the open moor south-east of Rhiconich but no basidiomycetes could be found in association with it. Beside streams and in swampy places the birch-rowan woods grade into

alder-willow swamps and here additional species of agaricales do appear, especially in association with the alder, *Alnus glutinosa*. These are listed separately below but the agaricales at least of the above birchwood list can confidently be described as being associates of *Betula pubescens* in the region in question.

It will be seen that there is not full agreement between the lists of fungi associated with birch in north-west Scotland and in the Jura and that there are at least two striking discrepancies. *Lactarius necator*, particularly characteristic of British birch woods was never seen in those of the Jura bogs though it is recorded as plentiful there under *Picea*. Favre suggested the birch woods were too wet for it and certainly the species was seen much less frequently in the very wet Sutherland woods than in the birch woods of the south of England. *Cortinarius armillatus* is plentiful in the Jura where it is " propre à la bétulaie moyennement marécageuse à *Hylocomium* divers, rarement à *Sphagnum* ". It is odd, then, that such a large and conspicuous species has not been seen on the northwest coast. Probably this is merely an accident. Cortinarii are notoriously erratic in fruiting and *C. armillatus* has been obtained frequently in Invernesshire and Morayshire, including collections beyond the Great Glen in Glen Urquhart 1895 and at the Drumnadrochit foray 1908. The absence from the list of *Russula venosa* Vel. and *R. versicolor* J. Schaeff., both characteristic of birch woods in England and in the Jura, may be due to their fruiting early, before most of the collections were made in the north-west.

Species of Alder–Willow swamps.

Mycena haematopus (Pers. ex Fr.) Kummer. On alder stump, Tongue ; on birch and alder in the Jura.

Hemimycena hiemalis (Osbeck ex Fr.) Singer. On mossy bark of *Salix atrocinerea*, Borgie Bridge ; Loch More.

Cortinarius (*My.*) *trivialis* Lange. Under willows, Ardnamurchan.

Alnicola escharoides (Fr.) Romagnesi. Tongue, also with *Alnus* in the Jura.

A. subconspersa (Kühner) Dennis, comb. nov. (= *Naucoria subconspersa* Kühner). Borgie Bridge.

Hypholoma elongatum (Pers. ex Fr.) Ricken. Among *Juncus supinus* under alders, Borgie Bridge.

Polyporus radiatus Fr. On alder, Tongue southwards ; parasitic and characteristic of old alders, occasionally found on other trees.

Polyporus varius Fr. On willows, Tongue southwards.

Clavaria cristata Fr. At foot of alder, Tongue ; under Picea in the Jura.

Lactarius lacunarum (Romagn.) Lange has not been observed in the woods but occurs with *Hypholoma myosotis* (Fr.) Lange in association with willow scrub on swampy ground in the Isle of Eigg. *Cortinarius* (*Derm.*) *decoloratus* (Fr.) Fr. was associated with dwarf bushes of *Salix atrocinerea* and *Myrica gale* at Rhiconich.

The following species not met with in the native woods were associated with an old-established plantation of *Fagus silvatica* in the grounds of Tongue House. *Oudemansiella mucida* (Schrad. ex Fr.) von Höhnel, *Tricholoma ustale* (Fr.) Kummer. *Mycena pura* (Pers. ex Fr.)

Kummer, *M. amicta* (Fr.) Quél., *Russula cyanoxantha* (Schaeff. ex Schw.) Fr., *R. emetica* (Schaeff. ex Fr.) Fr., *R. fellea* (Fr.) Fr., *Lactarius blennius* (Fr.) Fr., the common olivaceous form usually associated with beech, *L. mitissimus* (Fr.) Fr., *Leptonia lazulina* (Fr.) Quél., *Inocybe geophylla* (Sow. ex Fr.) Kummer, *I. petiginosa* (Fr.) Gillet, *Phaeomarasmius aridus* (Pers.) Singer on beech twigs, *Tubaria conspersa* (Pers. ex Fr.) Fayod, on beech litter, *Psathyrella gracilis* (Fr.) Quél. var. *corrugis* (Pers. ex Fr.) Pearson & Dennis, *P. velutina* (Pers. ex Fr.) Singer, *Coprinus atramentarius* (Bull. ex Fr.) Fr., and *Microglossum viride* (Pers. ex Fr.) Gillet.

M. aridus should no doubt be classed as native for it occurs on dead *Rosa* stems in West Ross, so probably should *T. conspersa* and *L. lazulina* which is not always found in woods. Of the remaining species the first, second, seventh and twelfth are closely associated with *Fagus* elsewhere and may be regarded as colonists introduced with the tree. The status of the others is doubtful but both species of *Mycena* and *I. geophylla* occur with birch in the Jura and *M. pura* appears in White's birch wood list for Glen Tilt.

Species of Pine woods, Borgie Forest and other small plantations.

There is no native pine in north and west Sutherland and Borgie Forest, the largest area of *Pinus silvestris* in the valleys of the north coast, is of quite recent origin. Mr. J. Fraser, Forestry Commission conservator of the northern area, kindly informs me that the oldest pines in the valley were planted in 1920. They suffered severely in the gales of 1952 and 1953, as did all plantations in the north-west, but remnants of this planting remain, supplemented by extensive areas of younger growth. An earlier pine plantation on the Ribigill estate at Tongue was felled by 1946. There is still a small pine plantation, much damaged by the gales, at Skelpick in Strathnaver and plantations of mixed conifers north of Tongue House which yielded little of interest. Hence the following short list of species associated with pine includes those which have colonised the area during the last 35 years.

Tricholomopsis rutilans (Schaeffer ex Fr.) Singer. Borgie, abundant.

Mycena alcalina (Fr.) Kummer. Tongue, on logs.

M. sanguinolenta (Alb. & Schw. ex Fr.) Kummer. Borgie.

M. viscosa (Secr.) R. Maire. Borgie.

Collybia cookei (Bres.) Arnold. Borgie, presumably from decayed *Russula*.

Marasmius androsacius (L. ex Fr.) Fr. Borgie, on fallen twigs and needles.

Russula sardonia Fr. Borgie, abundant.

R. xerampelina (Schaeff. ex Secr.) Fr. Skelpick.

Lactarius rufus (Scop. ex Fr.) Fr. Borgie, abundant.

Inocybe umbrina Bres. Borgie.

Pholiota carbonaria (Fr.) Singer. Borgie.

P. scamba (Fr.) Moser. Borgie, abundant on bare peat in the Jura.

Galerina marginata (Batsch ex Secr.) Kühner. Borgie.

Hypholoma capnoides (Fr.) Kummer. Borgie.

Suillus variegatus (Sow. ex Fr.) O. Kuntze. Loch More.

Polystictus abietinus (Pers. ex Fr.) Cooke. Borgie, on logs.

Calocera viscosa (Fr.) Fr. Borgie, on stumps.

Tremella foliacea Fr. Tongue, on fallen pine.

Exidia saccharina Fr. Tongue, on fallen pine.

Lycoperdon perlatum Pers. Borgie.

Suillus grevillei (Klotzsch) Singer, a common mycorrhizal fungus of *Larix*, occurred with scattered larches at Tongue.

Of this meagre list the species of *Suillus* and probably those of *Russula* and *Lactarius* are mycorrhizal fungi, *T. rutilans*, *G. marginata*, *H. capnoides*, *P. abietinus*, *C. viscosa* and *E. saccharina* are saprophytes of coniferous timber. All these may be regarded as colonists since the introduction of conifers to the area. The remaining species may well be native. Though one could not hope to sample a fungus flora adequately in a single season the much smaller number of species as compared with the list for birch woods does probably indicate a small flora in the pine woods, probably because of their recent origin.

Moorland Fungi.

Comparatively few of the larger fungi are closely associated with *Calluna* and only *Omphalina ericetorum* (Fr.) M. Lange, *Mycena sanguinolenta* (Alb. & Schw. ex Fr.) Kummer, *Marasmius androsaceus* (L. ex Fr.) Fr. and *Mycena pelliculosa* (Fr.) Quél. have been noted on heather moors in Sutherland. The very wet peat moors, predominantly Scirpetum caespitosi, form an unpromising habitat where the only really abundant agaric is *Omphalina ericetorum*. The north-west highland moors of this type have yielded the following additional species :

Marasmius androsaceus (L. ex Fr.) Fr. On *Scirpus caespitosus* at c. 1,000 ft., Applecross.

Hygrocybe miniata (Fr.) Kummer. Rhiconich southwards, often but not invariably with *Sphagnum*.

Entoloma helodes (Fr.) Kummer. Tongue, according to Favre this is a " nordic " species commonly associated with *Sphagnum*.

Gymnopilus fulgens (Favre & Maire) Singer. Tongue.

Galerina rubiginosa (Pers. ex Fr.) Kühner. Wet moor among *Molinia* and *Juncus*, Isle of Rhum.

Inocybe lacera (Fr.) Kummer f. *subsquarrosa* Møller. Isle of Rhum.

Galerina sahleri (Quél.) Favre sensu Favre. On bare peat, Rhum.

Coprinus martini Favre. On *Scirpus caespitosus*, Shieldaig.

Clavaria argillacea Pers. ex Fr. On vertical banks of peat, Laxford Bridge.

Several of the above are more or less closely associated with *Sphagnum*.

The following occur in living *Sphagnum* tussocks :

Omphalina onisca (Fr.) Quél. sensu Favre. Rhiconich.

O. sphagnicola (Berk.) Dennis, comb. nov. (= *Agaricus sphagnicola* Berk.). Applecross.

Nolanea cetrata (Fr.) Kummer. Tongue southwards.

Galerina paludosa (Fr.) Kühner. Tongue southwards.

G. sphagnorum (Pers. ex Fr.) Kühner. Tongue.

G. stagnina (Fr.) Kühner. Tongue.

G. tibiicystis (Atk.) Kühner. Rhum ; Eigg ; Loch Sunart.

Hypholoma elongatum (Pers. ex Fr.) Ricken. Tongue southwards.

H. udum (Pers. ex Fr.) Kühner. Isle of Rhum.

Of the sphagnicolous Galerinas *G. tibiicystis* and *G. paludosa* seem much more abundant than *G. sphagnorum* and *G. stagnina*. The last named seems to be generally uncommon but *G. sphagnorum* may be more plentiful on the Jura bogs where Favre cited numerous collections viz. : *G. tibiicystis* 136, *G. paludosa* 95, *G. sphagnorum* 54.

Grassland Fungi.

In the north-west Highlands grassland occurs largely as narrow roadside strips due no doubt to improved drainage in the soil around the roadside ditch. Native grassland occurs on sandy flats at the head of bays, on stabilised dunes and on occasional better drained patches on the moors, then often invaded by bracken. Archaeological sites such as ruined cairns tend to be well drained and covered with fine turf and are always worth a mycologist's attention in moorland country. The fine turf on sand by the sea might be expected to yield a richer fungus flora than the drained peat along roadsides but in Sutherland more collections have come from the latter. Hence the following list applies to roadside grass, usually predominantly *Agrostis* spp., unless otherwise indicated.

Cystoderma amianthina (Fr.) Fayod. Tongue southwards.

C. carcharias (Pers. ex Secr.) Fayod. Strathnaver ; Loch Stack.

Lepiota cristata (Fr.) Kummer. Sand dunes, Cuilabhacaidh.

Macrolepiota gracilenta (Krombh.) Moser. Turf by the shore, Applecross.

Collybia dryophila (Bull. ex Fr.) Kummer. Under bracken, Applecross.

Clitocybe fragrans (Sow. ex Fr.) Kummer. Under bracken, Strathnaver.

Mycena epipterygia (Scop. ex Fr.) Kummer. Under bracken, Loch Laxford.

M. alcalina var. *chlorinella* Lange. Turf by the Kyle, Tongue.

Hemimycena flavoalba (Fr.) Singer. Strathnaver.

H. fibula (Bull. ex Fr.) Singer. Tongue southwards.

H. setipes (Fr.) Singer. Tongue.

Hygrocybe calyptraeformis (Berk. & Br.) Fayod. Strathnaver on cairns and at the broch Dun Uiden.

H. chlorophana (Fr.) Karst. Tongue, Strathnaver and Scrabster southwards.

H. coccinea (Schaeff. ex Fr.) Kummer. Tongue, Strathnaver and Scrabster southwards.

H. conica (Scop. ex Fr.) Kummer. Applecross.

H. fornicata (Fr.) Singer. Scrabster.

H. laeta (Pers. ex Fr.) Kummer. Tongue and Strathnaver southwards.

H. langei Kühner. Isle of Rhum.

H. nigrescens (Quél.) Lange. Strathtongue and Strathnaver southwards.

H. punicea (Fr.) Kummer. Lairg.

H. psittacina (Schaeff. ex Fr.) Kummer. Tongue southwards.

Camarophyllus cinereus (Pers.) Karst. Castle Tioram in Moidart.

C. niveus (Fr.) Karst. Tongue and Strathnaver southwards.

C. pratensis (Pers. ex Fr.) Kummer. Tongue and Strathnaver southwards.

C. russocoriaceus (Berk. & Miller) Lange. Turf by the sea, Gairloch ; Applecross.

C. virgineus (Wulf. ex Fr.) Kummer. Applecross.

Clitopilus prunulus (Scop. ex Fr.) Kummer. Cliff tops, Scrabster.

Entoloma ameides (Berk. & Br.) Sacc. Isle of Rhum.

E. jubatum (Fr.) Karst. Tongue southwards.

E. sericeum (Bull. ex Merat) Quél. Applecross.

E. sericeum var. *nolaniformis* (Kühner) Dennis, comb. nov. (=*Rhodophyllus sericeus* var. *nolaniformis* Kühner). Turf by the Kyle, Tongue.

Nolanea staurospora Bres. Tongue southwards.

Leptonia asprella (Fr.) Kummer. Tongue ; Scrabster.

L. sericella (Fr.) Barbier. Tongue southwards.

Eccilia cancrina (Fr.) Ricken. Isle of Rhum.

Agrocybe praecox (Pers. ex Fr.) Fayod. Turf by the shore, Applecross.

A. semiorbicularis (Bull. ex Mérat) Fayod. Applecross.

A. vervacti (Fr.) R. Maire. Among *Psamma* on the dunes, Sandwood Bay.

Conocybe tenera (Schaeff. ex Fr.) Fayod var. *semiglobata* (Kühner) Romagnesi. Turf by the Kyle, Tongue ; Dune grassland, Sandwood Bay ; roadside with *Trifolium repens*, Tongue ; hill pasture, Fionnchro, Isle of Rhum.

Bolbitius vitellinus (Pers. ex Fr.) Fr. On the dunes, Cuilabhacaidh ; roadside grass, Applecross.

Galerina mycenopsis (Fr.) Kühner. Tongue ; Loch Laxford. Among *Hypnum cupressiforme* Hedw., *Thuidium tamariscinum* (Hedw.) B. & S., and *Hylocomium splendens* (Hedw.), B. & S.

G. muricellospora (Atk.) Kühner. Tongue with *Polytrichum juniperinum* Hedw. ; Loch na Gainimh with *Dicranum scoparium* Hedw. and *Pleurozium schreberi* (Brid.) Mitt.

Stropharia aeruginosa (Curt. ex Fr.) Quél. Borgie Bridge and Rhiconich, under bracken.

S. coronilla (Bull. ex Fr.) Quél. Turf by the sea, Applecross.

Panaeolina foenisecii (Pers. ex Fr.) R. Maire. Turf by the Kyle, Tongue ; dune grassland, Sandwood Bay.

Deconica atrorufa (Schaeff. ex Fr.) Karst. Tongue southwards.

Psilocybe semilanceata (Fr.) Kummer. Strathtongue southwards.

Agaricus campestris L. ex Fr. Isle of Rhum.

A. macrosporus (Møller & Schaeffer) Møller. Strathnaver.

A. porphyrocephalus Møller. Isle of Rhum.

Coprinus plicatilis (Curt. ex Fr.). Fr. Isle of Eigg ; Applecross.

Calvatia bovista (Pers.) Th. Fr. Turf by the Kyle, Tongue.

Lycoperdon perlatum Pers. Laxford Bridge.

Bovista nigrescens Pers. Turf by the sea, Applecross.

Clavaria argillacea Pers. ex Fr. Gravelly soil by Laxford Bridge.

C. corniculata Fr. var. *pratensis* (Fr.) Cotton & Wakef. Tongue southwards.

C. luteoalba Rea. Tongue.

C. inaequalis Fr. Turf by the Kyle, Tongue.

C. persimilis Cotton. Turf by the Kyle, Tongue.

C. vermicularis Fr. Applecross.

Corynetes atropurpureus (Batsch ex Fr.) Durand. Strathnaver southwards.

Geoglossum cookeianum Nannf. Sand dune turf, Gairloch.

G. fallax Dur. Rhiconich southwards.

G. glutinosum Pers. ex Fr. Strathtongue southwards.

G. nigritum Cooke. Bettyhill southwards.

G. starbackii Nannf. Tongue southards.

Trichoglossum hirsutum (Pers. ex Fr.) Boud. Moidart.

There are few records of the larger fungi from high altitudes in the highlands. In Glen Tilt White commented that " the only agaric that is met at all widely distributed on the hills is *Agaricus umbelliferus**, which ascends above 3,000 feet and is very variable in colour. Of a more truly alpine character is *Peziza axillaris*, which occurs at about 3,000 ft. on Ben Ghlo.' On this one may comment that *Nolanea cetrata* and some species of *Galerina* often accompany *Omphalina ericetorum* to high altitudes in Scotland. By *Peziza axillaris* White meant the fungus later interpreted as *Peziza carneola* Sauter, as is shown by a specimen from him under the former name at Kew. This occurs in association with *Tetraplodon mnioides* on dung of sheep and deer at high altitudes. There is a Sutherland collection from Quinag, July 1899.

The writer has noted the following agaricales among grasses and mossy rocks on mountain tops in the north-west Highlands :

Omphalina flava (Cooke) M. Lange 1955 (= *Agaricus umbelliferus* var. *flavus* Cooke). Wet mossy rocks, Sgurr of Eigg ; at 2,000 ft. on Meall Gorm, Applecross ; at 2,300 ft. on Ben Loyal.

Nolanea cetrata (Fr.) Kummer. At 2,300 ft. on Ben Loyal.

Galerina hypnorum (Batsch ex Fr.) Quél. In *Rhytidiadelphus loreus* (Hedw.) Warnst. and *Plagiothecium undulatum* (Hedw.) B. & S. in a crevice, 2,300 ft., Ben Loyal.

* ie. *Omphalina ericetorum* (Fr.) M. Lange.

G. mniophila (Lasch) Kühner. In *Pleurozium schreberi* (Brid.) Mitt., 1,500 ft., Ben Loyal.

G. muricellospora (Atk.) Kühner. In *P. schreberi*, 2,500 ft. on Ben Hope.

Galerina sp. (See below). In *Alicularia scalaris* (Schrad.) Cda. c. 2,000 ft., Ben Loyal.

Hypholoma polytrichi (Fr.) Ricken. In *Rhacomitrium* at c. 2,300 ft., Ben Loyal.

To these should perhaps be added *Mycena filopes* which occurred among *Rhacomitrium* among rocks though at a mere 1,000 ft. near Loch Beinn Tighe in the Isle of Eigg. It will be noted that the fungi are all stragglers from lower levels except *Omphalina flava*. This seems to be a true arctic-alpine species not found on the lowland moors. Møller had it in the Faroes " on turfy soil among small lichens " and remarked on its occurrence in the Norwegian mountains between 5,000 and 6,000 feet. Favre had it from high altitudes in Switzerland.* It occurs at about 2,000 ft. on Craig Rennet in Clova but, like so many alpine plants, descends to comparatively low levels in the western isles, to little over 1,000 ft. on the Sgurr of Eigg. No doubt White included *O. flava* in his *Ag. umbelliferus* but Stephenson (1886) records typical *O. ericetorum* from 4,000 ft. and " the golden yellow variety " i.e. *O. flava*, " only at the higher altitudes, up to 3,500 feet ". In the Faroe Is. Møller reported also *Galerina clavata* (Vel.) Kühner among *Hylocomium loreum* in the mountains. This is a common fungus on English lawns but has not yet been detected in the Highlands.

Panaeolus campanulatus and *Bolbitius vitellinus* recorded from grassland are probably dependent on animal droppings for their survival A few other species found commonly on moors and hill pastures grow directly on undecayed dung :

Anellaria semiovata (Sow. ex Fr.) Pearson & Dennis. Especially on horse and cow dung, Tongue southwards.

Stropharia semiglobata (Batsch ex Fr.) Quél. On dung of all kinds, abundant everywhere at low levels and up to about 1,000 ft. on Ben Loyal.

Panaeolus fimicola (Fr.) Quél. On rabbit droppings, Cuilabhacaidh.

Conocybe neoantipus (Atk.) Singer, sensu Kühner. Sandwood Bay.

Pholiotina coprophila (Kühner) Singer. On cow dung, Rhum.

Observations on Critical Species.

Mycena pelliculosa (Fr.) Quél., Champ. Jura & Vosges 67 (1872).

Agaricus pelliculosus Fr., Epicrisis Syst. Myc. 116 (1838).

Carpophores gregarious, not caespitose but sometimes in pairs ; pileus campanulate, 8–10 mm. diameter, sepia, paler at the margin, striate halfway to the disc, viscid ; stipe 30–40 × 1–1·5 mm., equal, concolorous or paler, viscid, hollow ; lamellae subdistant, narrow, ascending, broadly adnate, light gray, margin swollen and viscid ; flesh sepia, gray in the stipe. Tangential sections through the pileus show it to consist of 5 strata, a thick, colourless, gelatinous, surface layer with slender hyphae

* Lange (1955) found *O. flava* common in Greenland up to 72° N.

ramifying in hyaline mucilage ; a brown cuticle of broad, thinwalled, nongelatinised hyphae ; a trama of similar woven hyphae, strongly pseudoamyloid ; a thin gelatinised subhymenial tissue with loosely woven hyphae about 2μ wide and a hymenium with clavate 4-spored basidia 20–25 × 6–7μ. There are no pleurocystidia but a few slender paraphyses branched at the tip can be detected among the basidia in squashed sections. In the lamellae a slender central core of pseudoamyloid, broad, nongelatinised hyphae is enclosed by a gelatinous layer with outward curving branching hyphae 2μ thick. The gill edge is formed of similar slender clamped hyphae, diverging and ramifying in

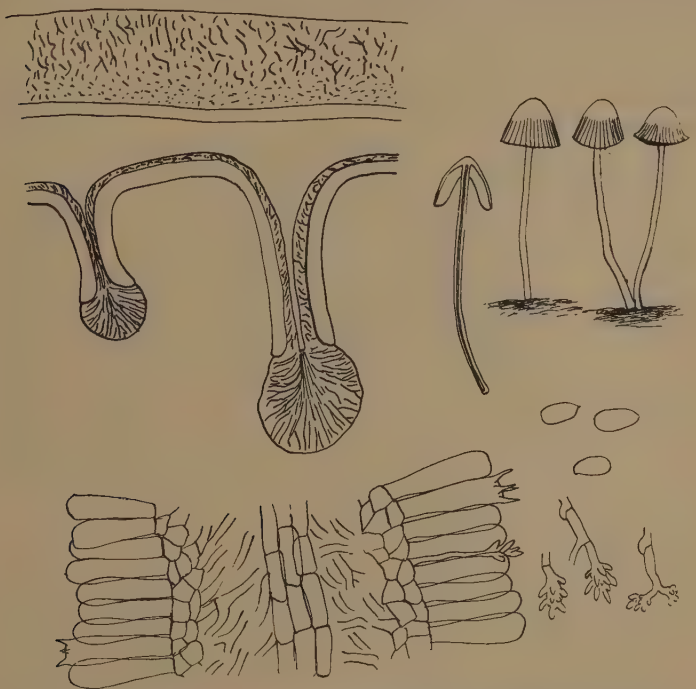

FIG. 1. *Mycena pelliculosa* sensu Cooke. Carpophores and section natural size, diagrammatic section of pileus × 100, section of lamella, spores and cheilocystidia × 660.

hyaline mucilage and ending in slightly clavate cheilocystidia, covered with short obtuse protuberances. A gelatinous sheath like that of the pileus covers the stipe. There is no distinctive odour and no juice exudes from the broken stipe. The spores are elliptical, 7–10 × 4·5–5μ and amyloid.

On bare peaty soil among *Calluna vulgaris*, Ardmore, Loch Laxford, Sutherland, 19.9.1954.

Mycena pelliculosa has been variously interpreted. Lange figured under this name what is evidently *M. epipterygioides* Pearson. In north America A. H. Smith has interpreted it as a fungus very like the above but with

inconspicuous pleurocystidia of two types, some like the cheilocystidia, others fusiform, and growing under conifers. In Monographia Hymenomycetum Sueciae 1857 Fries amplified his diagnosis of the species and stated it to grow " Ad terram sterilem ericetorum catervatim autumno seriori valde pluvioso " a description which precisely fits the circumstances of the Ardmore collection. Cooke probably figured the same species as *Agaricus pelliculosus* " On the ground in heathy places " in his Illustrations of British Fungi t. 246 (191) but as his specimens were not kept their anatomical characters cannot be verified today. It may be significant that neither Quélet nor Maire recognised this figure in their wellknown commentaries on Cooke's Illustrations but Rea endorsed it " *pelliculosa typical* ". Possibly *M. pelliculosa* is a northern species not familiar to French authors.

Xerocomus subtomentosus subsp. **punctatipes** (Martin) Dennis, comb. nov.

Boletus subtomentosus subsp. *punctatipes* Martin in Mater., Flore Crypt. Suisse **2** (1), 21 (1903).

In September 1954 two collections of a *Xerocomus* belonging to the *X. chrysenteron–X. subtomentosus* complex were made on the moors between Tongue and Bettyhill, on the north coast of Sutherland. Boleti of this group are usually found in woodland soils and their occurrence on the open moor out of sight of any tree seems worth recording. The first collection was made on a hill slope among short turf of *Agrostis* sp. about 2 feet from the nearest bush of *Calluna*. There was no *Salix*, *Betula* or *Myrica* in the vicinity, the nearest bushes were of *Salix arenaria*, about 200 yards downhill. The base of the stipe was firmly attached to a grass stem. The second collection grew beside a grassed track on level ground at about 250 ft. also amongst grass but only about 3 yards from *Salix aurita* bushes 2–3 feet high in the ditch on the opposite side of the track. In this instance, therefore, it was not impossible for the mycelium to have been in contact with willow roots.

The two collections were very similar in appearance and clearly belonged to the same taxon, which may be briefly described as follows :

Pileus convex, up to 3·5 cm. diameter, dry, pubescent, mummy brown to Dresden brown (Ridgway), sometimes cracking slightly to expose the pink subepidermal layer ; stipe 3·5–5 × 1·3–1·5 cm., subfusiform with a pointed base, solid, apex bright yellow, remainder pale yellow flushed with pink but almost concealed by Nopal Red granules which are less abundant and arranged in a vague reticulum towards the base of the stipe. Tubes about 1 mm. diameter, 5–7 mm. long, yellow, unchanged when cut, shorter towards the stipe, pores angular, bright yellow. Flesh straw yellow to barium yellow with a pink line below the surface of the pileus and over part of the stipe, not turning blue when cut but with a Nopal Red or gray zone near the base, basal 1 cm. near buckthorn brown. Spores fusiform, 11–12·5 × 5–6μ.

In colouring this fungus strikingly resembles *Boletus pachypus* Fr. sensu Kallenbach but that is a woodland species with a distinctly reticulated stipe and flesh turning blue when cut. Velenovsky described a *B. collivagus* Vel., akin to *X. chrysenteron*, from open heaths in Bohemia but it

had decurrent tubes and whitish flesh without the pink subepidermal layer. Numerous subspecies of *Boletus subtomentosus* were proposed by Martin (1903) in Switzerland. Four of these were from grassland though it appears that there were oaks not far away from some of them. According to Martin's key the Sutherland fungus could be assigned to subsp. *declivitatum* Martin, on account of its small size and the red basal zone in the flesh. A pinkish zone in the lower part of the stem appears also in his figure of subsp. *punctatipes* with which the Scottish material appears to agree better in shape and stature. It is proposed therefore, to adopt this name for the latter. The absence of any blue flush in the cut flesh is somewhat remarkable and it is desirable that this feature be care fully checked in any subsequent collections of *Xerocomus* from the moors.

Conocybe neoantipus (Atk.) Singer in Ann. Mycol. **34,** 433 (1936).

Galerula neoantipus Atk. in Proc. Amer. Phil. Soc. **57,** 371 (1918).

Carpophores solitary ; pileus 4–7 mm. diameter, conico-campanulate, closely but faintly pelucidly striate, smooth, dry, isabelline to clay colour ; stipe up to 3 cm. × 1 mm., paler than the pileus and with a white pruina ; lamellae narrow, ascending, yellowish-brown. Basidia 4-spored, spores ovoid with a prominent germ pore, 12–15 × 7–8·5μ, smooth, brown ; cheilocystidia ventricose below, capitate, basal portion 7–8μ thick, neck short, 1–2μ thick, head subglobose 3–4μ ; caulocystidia cylindrical, up to 50 × 2–3μ, base 5–8μ ; pileus surface formed of pyriform cells 10–20μ across.

On old dung, ? horse, Sandwood Bay, Sutherland, 20.9.1954, new to Britain.

Pholiotina coprophila (Kühner) Singer in Sydowia **4,** 141 (1950).

Galera coprophila Kühner in Le Botaniste **17,** 169 (1926).

Carpophores solitary ; pileus 1–2 cm. diameter, hemispherical to convex, smooth, moist, not striate, chamois to clay colour ; stipe 1·5–3 cm. × 2–2·5 mm., equal except for a slightly swollen base, white to cream, pruinose ; lamellae slightly ascending, adnate, pallid then rusty brown, 2–3 mm. wide. Basidia 4-spored, spores elliptical with a broad germ pore, smooth, brown, 12–14 × 7–7·5μ ; cheilocystidia ventricose, cylindrical and obtuse above, 20–33μ long, 9–10μ wide below, 4–5μ wide above.

On cow dung, Harris, Isle of Rhum, 21.7.1951 ; on sheeps' dropping, between Berwick and Burnmouth, Berwickshire, 31.10.1943. New to Britain.

Galerina sp.

Carpophores solitary ; pileus conico-campanulate, up to 1·5 cm. diameter, yellowish-brown, pellucidly striate halfway to the disc, smooth, dry ; stipe equal, flexuous, concolorous, with a white pruina throughout, hollow, without annulus or cortina ; lamellae somewhat crowded, about 2 mm. wide, adnate, becoming free, rusty brown ; flesh gray-brown, somewhat hygrophanous, cream-coloured in the stipe. Basidia 4-spored, spores elliptical, 9–11·5 × 4–5μ, brown, wall firm, slightly rugose ; cheilocystidia 30–40μ long, capitate with a swollen base 5–7μ wide, a

slender neck 1–2μ wide and a subglobose head 4–5μ across ; caulocystidia similar but with less attenuated necks ; pileus surface of broad, short-celled, hyphae.

Among *Alicularia scalaris* (Schrad.) Corda at about 2,000 feet on Ben Loyal, Sutherland, 14.9.1954. Fig. 2.

This unrecognised species seems akin to *Pholiota pumila* (Pers. ex Fr.) Gillet said to be common among moss in the mountains of the Faroe Is. and to have the annulus often obsolete or absent. From this it differs, however, in the pruinose stipe and narrower spores. *Galerina rubiginosa* (Pers. ex Fr.) Kühner differs in its broader spores 5–7μ wide.

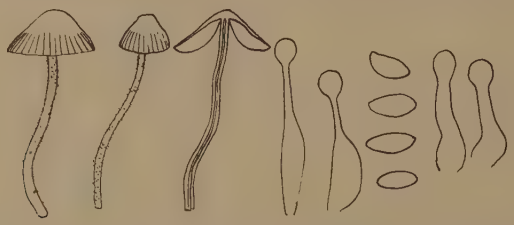

Fig. 2. *Galerina* sp. Carpophores natural size, cheilocystidia (left), spores and caulocystidia × 660.

The writer is indebted to Miss J. Taylor for determinations of Bryophyta associated with the species of *Galerina*, to Mr. R. D. Meikle for naming Salices, to Mr. D. A. Reid for assistance with the Aphyllophorales and to Mr. W. D. Graddon for working out the Geoglossaceae. The species of *Corynetes* and *Geoglossum* are not separable with certainty by eye and commonly grow in company so that mixed gatherings are the rule. Hence it is necessary to examine every fructification of these fungi microscopically.

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NOTES ON AFRICAN STRYCHNOS* : II.

E. A. Bruce

Strychnos § Ligustroides Duvign.

The section *Ligustroides* created by Duvigneaud† in 1952 shows the following salient features :—

Small evergreen *trees* or *shrubs* with neither spines nor tendrils. *Leaves* shining, leathery, like *Ligustrum*. *Inflorescence* terminal and axillary. *Flowers* small, often cleistogamous. *Corolla* rotate with the tube shorter than the lobes. *Stamens* inserted in the sinuses of the corolla and exserted. *Ovary* and style short, glabrous. *Fruit* 1 (–2) seeded. *Seed* like a coffee-bean with an elongate ridge down one side.

In his discussion of the section Duvigneaud points out that the following species are concerned :—*S. holstii*, *S. ligustroides*, *S. reticulata*, *S. procera*, *S. sennensis*, *S. elliottii*, *S. myricoides*, *S. pauciflora* and *S. henningsii*. He suggests that the first two species are synonymous and that the remaining ones belong to the "*holstii group*" and could perhaps be treated as varieties. I agree with him in his conclusions up to a point, but feel he has not gone quite far enough. I consider that the above species, together with *S. albersii* should be treated as one variable widely distributed species and placed under the oldest specific epithet *S. henningsii*.

Strychnos henningsii *Gilg* in Engl., Bot. Jahrb. **17** : 569 (1893) ; Fl. Cap. **4** (**1**) : 1052 (1909).

S. sennensis Bak. in Kew Bull. **1895** : 97 (April–May 1895) ; Fl. Trop. Afr. **4** (**1**) : 529 (1903).

S. holstii Gilg in Engl., Pfl. Ost–Afr. **C** : 310 (2 Aug. 1895) ; Fl. Trop. Afr. l.c. ; Inst. Roy. Col. Belg. **20** (**2**) : 585 (1949).

S. pauciflora Gilg in Engl., Bot. Jahrb. **28** : 121 (1899).

S. procera Gilg & Busse in Engl., Bot. Jahrb. **36** : 97 (1905) ; Tanganyika Check List l.c. **2** : 276 (1949).

S. albersii Gilg in Engl., Bot. Jahrb. l.c. 99 ; Tanganyika Check List l.c. 277.

S. elliottii Gilg in Engl., Bot. Jahrb. l.c. ; Trees and Shrubs of Kenya Colony ed. **1** : 92 (1926).

S. myricoides S. Moore in Journ. Bot. **45** : 52 (1907) ; Indigeneous Trees of Uganda ed. **2** : 169 (1951).

S. reticulata Burtt Davy & Honoré in Kew Bull. **1932** : 270 (1932) ; Tanganyika Check List l.c. 276 ; Trees and Shrubs of Kenya Colony ed. **2** : 125 (1936).

S. ligustroides Gossw. & Mendonça, Cart. Fitogeog. Angola, 120 (1939).

S. holstii var. procera (Gilg) Duvign. in Inst. Roy. Col. Belg. **20** (**2**) : 587 (1949).

S. holstii var. reticulata (Burtt Davy & Honoré) Duvign. l.c. incl. *f. condensata* and *f. laxiuscula*.

Belgian Congo : Matadi, 15 Oct. 1932, *Dacremont* 334 ! (cited by Duvigneaud under *S. holstii var. reticulata* f. *condensata*).

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* Continued from Kew Bull.

† Bull. Soc. Roy. Bot. Belg. **85** : 31 (Nov. 1952).

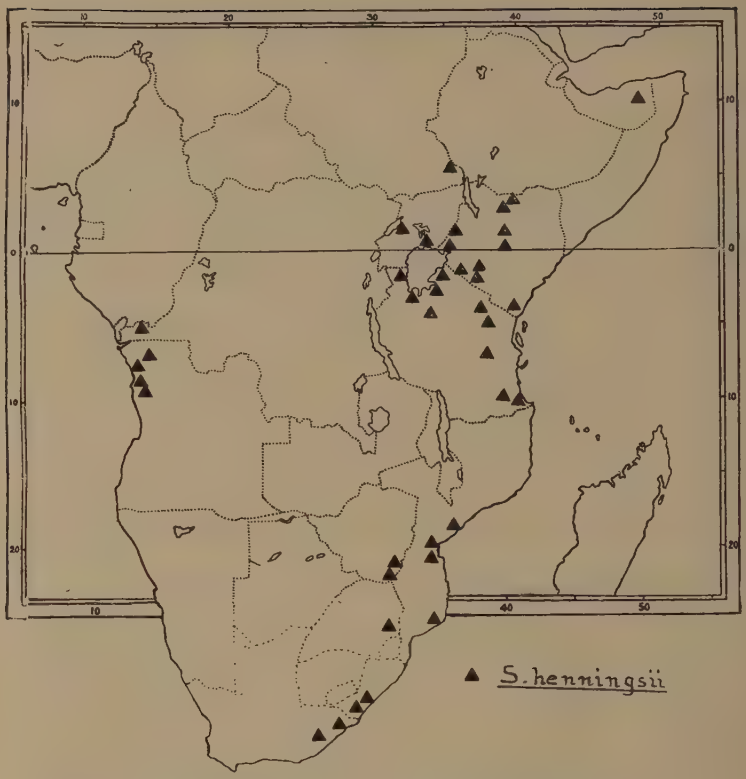


Fig. 1. Map showing distribution of *Strychnos henningsii* Gilg.

A.–E. Sudan : Lorienatom, Feb. 1943, *I. R. Dale* S319 !

British Somaliland : Golis Range, Gan Libah, 7 July 1945, *Glover* & *Gilliland* 1203 !, 1214 !

Uganda : Bunyoro District : Lake Albert Flats, *H. A. Lindeman* 526 ! ; Butiaba Escarpment, Bukumi, May 1933, *Eggeling* 1228 ! (*F.D.* 1331) ; east shore of Lake Albert, 24 Dec. 1905, *Bagshawe* 841 (holotype of *S. myricoides* in BM !).

Kenya : Northern Province : Moyale, 23 April 1952, *Gillett* 12914 ! ; without locality, *Conservator of Forestry* 40 (holotype of *S. reticulata* in K !) ; Nairobi, *Elliott* 176 (isotype of *S. elliottii* in K ! & EA !) ; Masai District : Ngong, *van Someren in A.H.* 9519 ! ; Kwale District : 5 miles east of Mackinnon Road, 9 Sept. 1953, *Drummond & Hemsley* 4226 !

Tanganyika : Lushoto District : West Usambaras, Kwai, *Albers* 380 (isotype of *S. albersii* in EA !) ; South Pare Mountains between Chome and Vudee, 6 July 1942, *Greenway* 6562 (neotype of *S. holstii* in K ! iso-neotype in EA !) ; Lindi District : island in Lake Lutamba, 14 May 1903, *Busse* 2506, 2511, 2511a and 2516 (iso.-syntypes of *S. procera* in EA ! HBG & BM !).

Portuguese East Africa : Valley of Zambesi, opposite Senna, 10 April 1860, *Kirk* s.n. (holotype of *S. sennensis* in K !) ; Lourenço Marques, 9 Dec. 1897, *Schlecter* 11682 (isotype of *S. pauciflora* in K ! & BM !) ; Namagoa, Mocuba, Sept. 1944, *Faulkner* 55 !

Southern Rhodesia : Sabi-Lundi Junction, 8 June 1950, *Wild* 3363 *in Govt. Herb.* 28260 !

Angola : Luanda District : Musseque de Viana, *Gossweiler* 10327 (iso.-syntype of *S. ligustroides* in K !).

Cuanza Norte District : between Ambriz & Lifune River, *Gossweiler* 4900 (iso.-syntype of *S. ligustroides* in K ! ; syntype in BM !) ; Cuanza Sul District : Seles, Oct. 1930, *Gossweiler* 9352 !

Transvaal : Nelspruit District : Malelaine, 25 Feb. 1949, *Codd* 5267 !

Natal : Berea, near Durban, 15 Dec. 1897, *Wood* 6672 ! ; Umlaas, 12 Nov. 1894, *Wood* 5427 !

Cape Province : Perie Forest, near King Williams Town, *Scott Elliot* 979 (neotype of *S. henningsii* in K !) ; near Komgha, *Flanagan* 1102 ! ; Transkei : Wakeni Forest Reserve, Umtumengwana Forest, 10 Feb. 1929, *Forestry Dept.* 7255 !

Note : I have examined the types of the above species with the exception of *S. henningsii* and *S. holstii* ; these latter were unfortunately destroyed at Berlin during the war. Kew is, however, fortunate in having two specimens (*Elliott* 979 and *Wood* 6672), which were compared by Dr. Schweickerdt with the syntypes of *S. henningsii* at Berlin in February 1938. Dr. Schweickerdt states that *Scott Elliot* 979 agrees very well with *Bachmann* 1745, one of the syntypes ; I therefore appoint *Scott Elliot* 979 to be the neotype of *S. henningsii*. Again, a specimen collected by Greenway (No. 6562) in the South Pare Mountains agrees well with the description of *S. holstii* and the locality is not far from Moshewa, the type locality of *S. holstii* ; I therefore appoint *Greenway* 6562 to be the neotype of *S. holstii*.

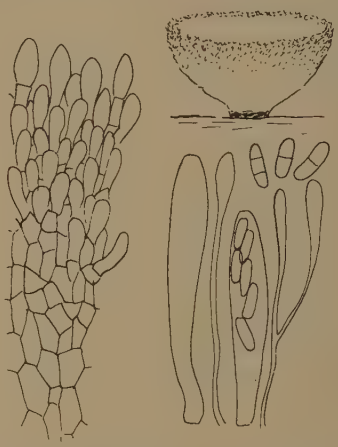
Variation : Here, as in many other savannah species of *Strychnos* with a wide distribution, there is great variation in leaf size and shape and in the length of the peduncle ; in this particular case there is also variation in the pubescence of the corolla-lobes. The South African material examined has glabrous corolla-lobes, but includes specimens with both large and small leaves and pedunculate and subsessile inflorescences. The East African material usually has corolla-lobes which are pubescent within in the lower part, often densely so, though there is a specimen from Ngong, Kenya Colony (*v. Someren in A.H.* 9519), which has almost glabrous corolla-lobes. Specimens from Portuguese East Africa have both types of leaves and corolla-lobes, whilst those from south-east Tanganyika often have sessile inflorescences and larger more acuminate leaves. The " coffee-bean " form of the seed, however, appears to be constant and is, I consider, a good specific character ; Miss I. C. Verdoorn* in her excellent paper on "Three species of Strychnos with 1-seeded fruits " was also of this opinion. Thus, in spite of the wide range in variation there is very little correlation between the different characters and I feel that no good purpose can be served by attempting to divide the species into either subspecies or varieties.

* Bothalia **3** : 583–588, fig. 1 (1939).

A MINUTE DISCOMYCETE ON LARCH TWIGS.

R. W. G. Dennis

A collection recently received from Yorkshire appears to represent the very minute fungus on larch twigs which Velenovsky referred to a variety of *Belonium piceae* Henn. as " Var. *laricinum*. Ap. minora, alba, subtus fusca, sporae 6–10, paraph. apice claviculatae (5) oleosae, in ramulis laricinis prope Mnichovice ". (Bohemia). In this laconic diagnosis the figures indicate dimensions in μ and the spores may be assumed to be septate, else he would not have referred it to *Belonium*, and to resemble those of *B. piceae* which he described as 1-septate, 8 12μ long. *B. piceae* was said to have sessile apothecia 0·3–0·8 mm. across so that those of the variety were presumably about 0·3 mm. or less in diameter. The Yorkshire collection may be described as follows :



Above : apothecium of *Belonium piceae* var. *laricinum* on *Larix* bark × 100. Below, left : margin of receptacle in surface view. Right : asci, paraphyses and free septate ascospores × 660. All from Bramley K 12/55.

Apothecia scattered, superficial, about 300μ diameter, disc concave, white to pale yellow ; receptacle cupshaped, sessile on a small brown base or with a very minute stalk easily overlooked, concolorous with the disc, minutely pruinose, especially towards the margin. Asci clavate, 50–60 × 8–10μ, 8-spored, pore not blued by Melzer's reagent ; ascospores irregularly biseriate, elliptic-cylindric or inequilateral, 7–11 × 3–3·5μ, becoming 1-septate, seldom 2-septate ; paraphyses cylindrical, often branched below, 1–1·5μ thick with conspicuous clavate tips up to 5μ wide, with oily contents ; excipulum of " textura prismatica ", with a ring of brown cells at the base of the receptacle, clothed with minute thin-walled, smooth, clavate hairs up to 15 × 5μ. On fallen twigs of *Larix*, near Pickering, Yorkshire, 13.iii.1955, *W. G. Bramley* K 12/55.

Clearly this is a *Cistella* in the sense of Nannfeldt but a transfer to that genus may be deferred until generic limits in these very minute Hyaloscyphaceae are better understood. One may hope also that further collections on coniferous bark may clarify the relationship between this variety on *Larix* and *B. piceae* which was originally described from bark of *Picea excelsa* in Russia.

SVENSONIA and CHASCANUM in East and North-East Tropical Africa and Arabia.

J. B. Gillett

Considerable further material has been collected from this area since Moldenke's monograph of this group (*Svensonia* in Fed., Rep. **41,** 129–143 (1936) ; *Chascanum* in Fed., Rep. **45,** 113–160, 300–319 (1938) ; **46,** 1–12 (1939) ; Rev. Sudam. Bot. **6,** 15–24 (1939).) It therefore seems worth while to summarise the additional knowledge thus gained and to provide a revised key to the species concerned ; particularly as these are often difficult to distinguish. As Moldenke cites specimens extensively this is here omitted, except for the types, specimens showing considerable extensions of range and changed identifications. All specimens cited have been seen unless enclosed in brackets, and are at Kew, unless otherwise indicated. It will be noted that of the 9 species concerned, one is new, while 2 are known only from the type gatherings made more than sixty years ago, and there is every likelihood that further careful collecting will reveal additional new species of this rather attractive group in what is still, to a great extent, the " unknown horn of Africa ".

Thanks are due to Prof. Humbert for the loan of the type of *C. arabicum*, from Paris.

Key to the Species.

Mericarps ending in a wing ; hairs of inflorescence dense, short **Svensonia**

Wing of mericarp erect ; calyx under 10, corolla under 20 mm. long 1. *S. laeta*

Wing of mericarp curved outwards when fully mature ; calyx over 10 ; corolla over 24 mm. long . . . . . 2. *S. moldenkei*

Mericarps truncate, or, if somewhat pointed and almost winged (in No. 7), then many hairs on inflorescence long and spreading **Chascanum**

Leaves not linear :

Base of leaf essentially truncate, its outer part forming an angle of 80–90° with the midrib, the inner part, which is attenuate into the petiole shorter than the unwinged petiole itself :

Calyx c. 6 mm. long, less than twice as long as bract ; tertiary nerves on under side of leaves prominent ; indumentum of relatively sparse bristly hairs of uneven length, some of those on stems and petioles being up to 1 mm. long, corolla limb white or cream . . . . . 3. *C. marrubiifolium*

Calyx c. 8 mm. long, more than twice as long as bract ; tertiary nerves not prominent on underside of leaves, indumentum of dense very short hairs (all under 0·1 mm.) corolla limb brownish yellow or purplish . . . . . 4. *C. arabicum*

Base of leaf not truncate, its outer part forming an angle of less than 50° with the midrib, passing gradually into the inner part, which is longer than the unwinged petiole (if there is one), calyx more than twice as long as bract :

Inflorescence without long spreading hairs, with a dense short indumentum (not above 0·2 mm. long) :

Limb of corolla dark brownish yellow or purplish ; bract c. 3 mm., calyx 6–8 mm., corolla tube not over 18 mm. long ; usually some long hairs, as well as short ones, on leaf base and stems . . . . . 5. *C. gillettii*

Limb of corolla white or cream, bract c. 2 mm., calyx c. 8 mm., corolla tube usually over 20 mm. long ; short hairs only throughout the plant . . . . . 6. *C. sessilifolia*

Inflorescence with long spreading hairs (0·4–1·0 mm.) as well as relatively sparse short hairs ; corolla limb white or cream :

Leaves attenuate at base into a petiole which is often fairly long ; corolla not above 25 mm. long . . 7. *C. hildebrandtii*

Leaves lanceolate, not attenuate at base, almost sessile, corolla c. 30 mm. long . . . . . 8. *C. hanningtonii*

Leaves linear entire ; corolla tube 10–12 mm. long 9. *C. rariflorum*

1. **Svensonia laeta** (*Fenzl, ex Walp.*) *Moldenke* in Fed., Rep. **46,** 5 (1939).

Chascanum laetum Fenzl. ex Walp., Repert. **4,** 39 (1845).

Bouchea pterygocarpa Schau. in DC., Prod. **11,** 558 (1847) ; F.T.A. **5,** 282.

Svensonia pterygocarpa (Schau.) Moldenke in Fed., Rep. **41,** 136 (1936).

Yemen ; A.E. Sudan *Kotschy* 230 isosyntype ; Ethiopia *Schimper* (1839) 1012 isosyntype ; Eritrea *Bally* 6828 ; Br. Somaliland *Gillett* 4550 ; - Kenya. N. Prov. ; Masai Prov. ; Tanganyika. N. Prov. Tanga Prov.

2. **S. moldenkei** *Gillett* sp. nov. ; ab. *S. laeta* floribus longioribus, mericarpium alis brevioribus extrorse curvatis, differt.

Suffrutex sublignosus ad 2 m. altus, ramis dense retrorseque puberulis. *Folia* opposita vel subalterna ovato-oblonga, grosse serrato-dentata, basin in petiolum puberulum 6–8 mm. longum breviter attenuatum, utrinque breviter puberula, nervis superne impressis, inferne prominentibus, ad 35 mm. longa, 20 mm. lata. *Inflorescentiae* spicatae, terminales, ad 35 cm. longae, omnino dense puberulae, bracteis anguste deltoideo-subulatis c. 5 mm. longis, pedicellis subnullis (0·5 mm. longis). *Calyx* c. 11 mm. longus, dense puberulus, pilis rectis, vel paulo retrorsis, 0·05–0·15 mm. longis, ad 5 costas viridis, inter costas membranaceus, post anthesin ad basin unilaterale fissus, 5-dentatus dentibus crasse subulatis viridibus acutis inaequalibus, duo 0·8 mm. duo 0·5 mm., uno 0·2 mm.

longo. *Corollae* tubus cylindricus paulo curvatus extus fere glaber (pilis retrorsis c. 0·2 mm. longis sparsissime indutus) intus pubescens, 35 mm. longus, 1·5 mm. diametro ; lobi tenuiter reticuloso venati subaequales oblongi, apice rotundati, ad basin intus (superne) pilis rigidis erectis 0·1–0·2 mm. longis sparse obtecti, extus glabri, 5 mm. longi c. 2·2 mm. lati. *Filamenta* c. 1 mm. longa, unum sterile 4 mm. infra corollae tubi orem insertum, duo 3 mm. infra orem, duo 2 mm. infra orem inserti. *Antherae* ovales, c. 1 mm. longae loculis inaequalibus. *Ovarium* 2 mm. longum, glabrum. Stylus 37 mm. longus, glaber. *Stigma* papillosus ovoideus c. 0·5 mm. longus, 0·1 mm. stipitatus, ad angulum 120° positus. *Mericarpia* glabra semicylindrica, in toto 7·5 mm. longa, 1·2 mm. diametro, basin foveolata intus sparse papillata, extus nervosa, versus apicem paulo reticulato-sculpta, ad apicem alata, ala 1·3 mm. longa e plano mediano ad angulum c. 40° curvato, alis lateralibus subnullis.

N. Kenya. 53 Km. SW. of Mandera on road to El Wak, c. 3°53′ N., 41°30′ E., 390 m., on red sandy soil over sandstone, in *Commiphora*-*Acacia* open scrub, up to 2 mm. tall, corolla milk white, 30.5.1952, *Gillett* 13397 K, holo., EA, isotype.

E. Ethiopia. Between Walwal and Sirauw, c. 7°10′ N., 45°20′ E., c. 600 m., in open places on red sand, erect bushy plant of 60–90 cm. with spikes of white flowers, 26.11.1944, *Glover & Gilliland* 434.

There is a slight element of doubt about *Glover and Gilliland* 434 which has only immature mericarps which are more papillose within than are those of the type. The characteristic outward bending of the wing only appears when the mericarps are fully mature.

3. **Chascanum marrubiifolium** *Fenzl. ex Walp.*, Repert **4,** 38 (1845).

Bouchea marrubiifolia (Fenzl. ex Walp.) Schau. in DC., Prod. **11,** 558 (1847) ; F.T.A. **5,** 282.

Yemen ; Aden ; Sind ; Fr. Sudan *Hagerup* 345 ; A.–E. Sudan *Kotschy* 32 isotype ; Eritrea ; S. Ethiopia, 5°25′ N., 37°5′ E., *Donaldson Smith* 371 BM ; Kenya. N. Prov. ; Turkana Prov.

There are no specimens of this species at Kew or the British Museum from Somaliland. It is reported by Chiovenda, Fl. Somala **1,** 274 from N. Somalia but the specimen has not been seen.

4. **C. arabicum** *Moldenke* in Fed. Rep. **45,** 138 (1938).

Yemen. Hodjeilah 600 m., 30.4.1887, *Deflers* 72 P, holo. E. Ethiopia. Between Walwal and Sirauw, 17°10′N., 45°20′ E., c. 600 m., in open places, bushy plant, corolla purple brown with a yellow tube, 26.11.1944, *Glover & Gilliland* 423.

Deflers does not mention the corolla colour but from the dried specimen it appears that the limb is markedly darker than the tube and that the colour is thus probably brownish yellow or purplish rather than white or cream.

5. **C. gillettii** *Moldenke*, Rev. Sudam. Bot. **6,** 18 (1939).

Fruits and some of the collector's notes are absent in the Stockholm sheet of *Gillett* 4934 which is Moldenke's type : the description is accordingly amplified as follows from the Kew sheet.

Calyx fructifer paulo inflatus, ad basin fissus, 7 mm. longus. *Mericarpia* glabra, straminea, oblonga, apice reticulato-sculpta basin versis distanter longitudine striata, 4 mm. longa 1 mm. lata.

Br. Somaliland. Nr. Buramo, 10°5′ N., 43°10′ E., 1020 m., on stony limestone hill with *Acacia bussei* open woodland, corolla limb brownish yellow, tube cream, 4.2.1933, *Gillett* 4934 isotype. 30 km. from Buramo, 1650 m., flowers apricot colour, 16.8.1953, *M. White* 132. Bihendula, 10°9′ N., 45°7′ E., 900 m., 30.5.1949, *Bally* 7272. Upper Sheikh, 9°55′ N., 45°10′ E., *Thomson* 41, 46. Rugger Pass, *Mrs. Lort Phillips* s.n. BM. Wagga Mt., *Mrs. Lort Phillips* s.n. B.M. Buran 10°14′ N., 48°47′ E., 975 m., on rocky ground, flowers reddish brown, 27.9.1929, *Collenette* 99.

Kenya. N. Prov., Dandu, 3°26′ N., 39°54′ E., in cracks in granite rocks in *Acacia-Commiphora* scrub, corolla limb deep yellow, tube cream, 14.5.1952, *Gillett* 13196.

It seems that the corolla limb is consistently dark yellow brown or purplish resembling that of *C. arabicum* and different (so far as is known) from that of all other species in N.E. Africa.

6. **C. sessilifolium** (*Vatke*) *Moldenke* in Phytologia **1,** 18 (1933).

Bouchea sessilifolia Vatke in Linnaea **3,** 529 (1882). F.T.A. **5,** 283.

Br. Somaliland. Yafir, Ahl Mts., c. 48°E., 1950 m. (*Hildebrandt* 855a B, holo.). Adda Galla, *James & Thrupp* s.n. neotype, *Appleton* s.n., Golis range *Drake Brockman* s.n., Between Rugger Pass and Berbera *Lort Phillips* s.n. Barataga 10°5′., 44°1′ E., 1290 m. in grassy places on mountain among *Buxus hildebrandtii*, 1 m. tall, corolla cream, *Gillett* 4518. N. of Hargeisa, 1290 m., on stony sandstone slopes, corolla white, *Gillett* 3992. Gan Libale, 1320 m., at edge of *Juniperus* forest, corolla white, *Bally* 7322.

I have accepted this species in the sense in which it has been understood by Baker in the Flora of Tropical Africa and by Moldenke. Neither of these botanists saw Hildebrandt's type specimen which comes from an area considerably to the east of that of the other specimens. There are certain discrepancies between Vatke's description and the species as here understood (notably corolla length). It is desirable that close search should be made for this genus in Hildebrandt's original locality.

7. **C. hildebrandtii** (*Vatke*) *Gillett* comb. nov.

Stachytarpheta hildebrandtii Vatke in Linnaea **43,** 529 (1882) ; F.T.A. **5,** 284.

Chascanum africanum Moldenke in Fed., Rep. **45,** 136 (1938).

Uganda. N. Prov. Karamoja Distr. Kenya. N. Prov. ; Turkana Prov. ; Central Prov. *Hildebrandt* 2737 K, BM, isotypes, *Gardner* 3372 type of *C.africanum*. Tanganyika. N. Prov. ; Tanga Prov., East Prov.

There is no doubt that this plant is a *Chascanum*. Vatke does not mention the number of stamens (2 in *Stachytarpheta*, 4 in *Chascanum*) : there are 4 in the Kew sheet of *Hildebrandt* 2737 and in all other specimens examined. Vatke, followed by Baker, states that the calyx of *S. hildebrandtii* is 4-ribbed and 4-toothed. Examinations of *Hildebrandt* 2737 and other specimens

shows it to be 5-ribbed and 5-toothed as is usual in both genera and as described by Moldenke for *C. africanum*.

Moldenke cites the British Museum sheet of *Hildebrandt* 2737 as *C. africanum*, in ignorance of the earlier description of this number (presumably the Berlin specimen) as *S. hildebrandtii*. This species has been reported from British Somaliland by Moldenke (l.c.) and by Hutchinson and Bruce (Kew Bull. **1941** : 176). However, of the specimens cited, *Thomson* 41, 46 and *Gillett* 4934 are *C. gillettii*, *Gillett* 4550 is *Svensonia laeta* and 4518 is *C. sessilifolium*. True *C. hildebrandtii* has, so far, not been seen from further north than Dandu (3°26′ N.) in N. Kenya (*Gillett* 13053, 13230). There is great variation in the apex of the mericarp in *C. hildebrandtii*. In some specimens, e.g. *Kirrika* 75, this is definitely truncate, in others, e.g. *Bally* 498, *Verdcourt* 759, it is pointed and a small wing is formed ; yet others are intermediate. These differences do not seem to be correlated with other characters. The wing, if present, is much smaller than in *Svensonia laeta* and the differences in indumentum readily distinguish the two species, but these forms of *C. hildebrandtii* with rudimentary wings, together with the relatively short wing in *Svensonia moldenkei* certainly cast some doubt on the generic status of *Svensonia*. *Chascanum angolense* Moldenke, at present known only from a single gathering, is extremely close to some forms of *C. hildebrandtii* and future work may well show it to be conspecific.

8. **C. hanningtonii** (*Oliv.*) *Moldenke* Torreya **34,** 9 (1934).

Bouchea hanningtonii Oliv. in Hook. Ic. Pl. **15,** 37 : pl. 1446 (1883) F.T.A. **5,** 283.

Tanganyika, probably in an area between 36°25′ and 37°35′ E. and 6°15′–20′ S. 1882–3 *Bishop Hannington* s.n. holotype.

Note. Moldenke places this species in his subgenus *Euchascanum* ; however bracteoles are absent and the only cocci visible in the solitary specimen are too young to decide whether they separate spontaneously when ripe or not. It seems better placed in subgen. *Rhagocarpium* next to *C. hildbrandtii*.

9. **C. rariflorum** (*A. Terrace.*) Moldenke in Phytologia **1,** 167 (1935).

Hebenstreitia rariflora A. Terrace. in Bull. Soc. Bot. It. **1892,** 424.

Bouchea rariflora (A. Terrace.) Chiov. in Ann. di Bot. Rom. **9,** 127 (1911).

Ethiopia, country of Rer Amaden, c.43 °E., 6°50′ N., Apr. 1891. (*Baudi de Vesmé* + *Candeo* sn. Fl. ? type).

From the description this is a very distinct plant which requires further investigation.

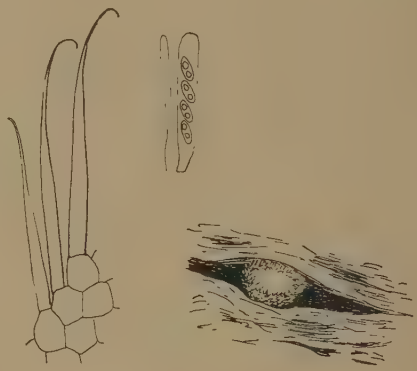
C. adenostachyum (Schau.) Moldenke.

Moldenke in Revist. Sudam. Bot. **6,** 16 (1939) identifies *Lort Phillips* (Wagga Mts. 1897) s.n. BM and (Rugger Pass) s.n. BM from British Somaliland as this species. However the specimens concerned lack the characteristic glandular hairs on the inflorescence of *C. adenostachyum* (a South African species) and appear to be *C. gillettii*.

AN OVERLOOKED SPECIES OF UNGUICULELLA.

R. W. G. Dennis

Peziza robergei Desm. was described over a century ago, on the bark of living branches of *Lonicera*. Saccardo referred it to *Lachnella* and subsequent authors have accepted this disposition, apparently without studying the fungus, which has no doubt been generally overlooked because of its small size and inconspicuous character. Examination of the material distributed by Desmazières as Crypt. France Ser. 1, 1416 showed *P. robergei* to be a good species of *Unguiculella*.



Right: apothecium of *Unguiculella robergei* in crack of *Lonicera* bark × 20. Left: hairs, ascus and paraphysis × 660. All from Desmazières 1416.

Unguiculella robergei (*Desm.*) *Dennis*, comb. nov.

Peziza robergei Desm. in Ann. Sci. Nat. Bot. Ser. 3, 3, 365 (1845).

Lachnella robergei (Desm.) Sacc., Syll. Fung. 8, 395 (1889).

As far as superficial characters go one can scarcely improve on Desmazières' graphic description : " Cette petite espèce nous a été adressée par M. Roberge, qui l'a observée en avril, mai et juin, sur les branches et les rameaux vivants de plusieurs *Lonicera*. Elle disparaît presque entièrement par la dessiccation ; mais, si on l'humecte, elle reprend aussitôt les apparences de la vie, en montrant de jolies cupules érumpentes éparses ou rassemblées en petits groupes (deux, trois ou quatre individus), fermées d'abord et globuleuses, puis ouvertes en soucoupe concave, alleignant dans leur plus grand développement 1 millimètre ou un peu plus de diamètre ; elles sont hérissées à l'extérieur de poils courts, d'un rouge de brique, excepté sur les bords, où ces poils sont blanchâtres. Toute la plante est également d'un rouge de brique, mais elle pâlit en séchant. Les thèques, qui ont environ 1/25 de millimètre, sont presque claviformes, et renferment huit sporules ovoïdes." The asci are clavate, up to 33 × 4·5μ, with rounded tips not blued by Melzer's reagent ; ascospores biguttulate, 5–6 × 2·5μ ; paraphyses cylindrical, about 2μ thick, no longer than the asci ; hairs 40–55μ long by 3–4μ thick at the base, thinwalled, light reddish-brown below, paler above and tapering to a bristle-like hooked tip scarcely 0·5μ thick.

REVISION OF THE "FLORA OF WEST TROPICAL AFRICA" —VII*.

R. W. J. Keay

VIOLACEAE

Decorsella *A. Chev.* in Bull. Soc. Bot. Fr. **61,** Mém. **8** : 297 (1917).

Gymnorinorea Keay in Kew Bull. **1953** : 75 (1953).

Decorsella paradoxa *A. Chev.*, l.c. 298 (1917).

Rinorea abidjanensis Aubrév. et Pellegr. in Bull. Soc. Bot. Fr. **92** : 256 (1946) ; Aubrév., Fl. For. Côte d'Ivoire **3** : 26, t. 253, 6-8 (1936), *descr. gallice.*

Gymnorinorea abidjanensis (Aubrév. et Pellegr.) Keay l.c., 76, fig. 3 (1953); Keay in F.W.T.A., ed. 2, **1** : 104, fig. 32 (1954).

Type :—Ivory Coast, Danané, *Chevalier* 21277 (P, holotype !).

Decorsella was described by Chevalier as a monotypic genus in the *Urticaceae*. Unfortunately the genus was completely overlooked by Hutchinson and Dalziel in the Flora of West Tropical Africa and there is none of Chevalier's specimens of it in the Kew or British Museum herbaria. While in Paris in July 1954 I looked up *Decorsella* in the herbarium so that I could account for the genus in the *Urticaceae* of the F.W.T.A. which I was soon to revise ; Chevalier's specimens of *Decorsella* proved to be fruiting material of my own new genus *Gymnorinorea* ! Chevalier completely misinterpreted the remarkable " gymnospermous " gynoecium, but his description is quite valid and his name must stand.

CHAILLETIACEAE

Dichapetalum guineense (*DC.*) *Keay*, comb. nov.

Ceanothus ? guineensis DC., Prodr. **2** : 30 (1825).

Rhamnus paniculatus Thonn. in Schum. Beskr. Guin. Pl. 131 (1827).

Chailletia paniculata (Thonn.) Benth. in Hook., Niger Fl. 279 (1849).

Dichapetalum paniculatum (Thonn.) De Wild. in Rev. Zool. Afr. **6,** Suppl. Bot. 57 (1919).

Chailletia benthamii F. Didr. in Kjoeb. Vidensk. Meddel. **1854** : 196 (1855).

Chailletia flexuosa Oliv., F.T.A. 1 : 340 (1868).

Dichapetalum flexuosum (Oliv.) Engl. in Engl. et Prantl Pflanzenfam. **3, 4** : 349 (1896).

Chailletia floribunda Planch. var. *β* Oliv., l.c. 341 (1869).

Dichapetalum rowlandii Hutch. et J. M. Dalz., F.W.T.A. **1** : 324 (1928).

Type :—Guinea *Thonning* s.n. (Hb. Puer., holotype ; C, isotype !).

Through the courtesy of Dr. Hagerup of Copenhagen I have been able to examine Thonning's specimen which is clearly the type of *Ceanothus ? guineensis* DC. (1825), *Rhamnus paniculatus* Thonn. (1827) and *Chailletia*

* Continued from K.B. 1954, 275 (1954).

benthamii F. Didr. (1855). Bentham (1849) suggested that this plant was *Chailletia toxicaria* G. Don (1824) and subsequently the epithets based on Thonning's specimen have remained almost in oblivion. De Wildemann made the new combination *Dichapetalum paniculatum* in 1919, but did not account for the species taxonomically.

In the course of my work on the revision of the F.W.T.A. I noticed that there is no authentic record of *Dichapetalum toxicarium* (G. Don) Baill. from the Gold Coast, it was therefore essential to see the type of *Rhamnus paniculatus* Thonn. which was described as " common in coastal landscapes " in what is now the Gold Coast. It proved to be the plant hitherto usually known as *Dichapetalum flexuosum* (Oliv.) Engl.

The first publication of this species was evidently that by De Candolle (1825) who cited the manuscript name *Rhamnus paniculatus* Thonn. under his *Ceanothus ? guineensis*. Thonning's name was published at least two years later (1827). This duplicate publication of names for one of Thonning's specimens is more or less paralleled in two species of *Uvaria* (Annonaceae) discussed in Kew Bull. 1952 : 543–544.

ZYGOPHYLLACEAE

Kallstroemia pubescens (*Don*) *Dandy*, comb. nov.

Tribulus pubescens Don, Gen. Syst. **1** : 769 (1831).

Kallstroemia minor Hook. f. in Hook., Niger Fl. 269 (1849), *nomen illegitimum.*

[*Tribulus maximus* (non L.)—Oliv., F.T.A. **1** : 284 (1868) ; Hutch. & Dalz., F.W.T.A. **1** : 136 (1927).]

Kallstroemia caribaea Rydb. in N. Amer. Fl. **25** : 111 (1910).

Tribulus pubescens was described by George Don as " Native of Acra in Guinea ", and a specimen collected by him and now preserved in the British Museum Herbarium is clearly to be regarded as the type, though it bears neither the locality " Acra " nor the name *T. pubescens* in Don's hand ; J. D. Hooker, however, has labelled it " *Kallstroemia minor*, Fl. Nigr. Cape Coast Don ". This specimen belongs to the genus *Kallstroemia* and matches *K. caribaea* Rydb., in which the fruit lacks the large spines found in *Tribulus terrestris* L. but bears numerous muriculations which evidently account for Don's statement " Capsules prickly " in his description of *T. pubescens*.

Hooker in the Niger Flora correctly referred *Tribulus pubescens* to *Kallstroemia*, but unfortunately changed the epithet unnecessarily to *minor*. Oliver in the Flora of Tropical Africa identified the plant with the American *T. maximus* L. (i.e. *K. maxima* (L.) Torr. & Gray) and was followed by Hutchinson and Dalziel in the Flora of West Tropical Africa ; but this treatment is incorrect, for *K. maxima* has glabrous fruits whereas those of the African plant are appressedly hairy as in *K. caribaea*, a species described from the West Indies as recently as 1910. No doubt *K. pubescens*, as it must now be called, was introduced long ago from tropical America into West Africa, so that here we have a case of a species described from its country of introduction long before it was recognized as a distinct species in its real home. The following specimens of *K. pubescens* have been seen from West Africa :—

GOLD COAST: "Cape Coast" [Accra], *Don* (type BM). Cape Coast, *Vogel* 58. Achimota, *Irvine* 657. Adaiso, *Morton* GC 6148.

NIGERIA: Lagos, *Dalziel* 1039.

J. E. Dandy.

EUPHORBIACEAE

Maesobotrya barteri (*Baill.*) *Hutch.* var. **sparsiflora** (*Sc. Elliot*) *Keay*, comb. nov.

Baccaurea sparsiflora Sc. Elliot in Journ. Linn. Soc. **30**: 97 (1894).

M. floribunda Benth. var. *sparsiflora* (Sc. Elliot) Pax et K. Hoffm. in Engl. Pflanzenreich **4, 147, 15**: 20 (1922).

Type:—Sierra Leone, near Sasseni, Scarcies, *Scott Elliot* 4543 (K, lectotype !).

Crotonogyne chevalieri (*Beille*) *Keay*, comb. nov.

Neomanniophyton chevalieri Beille in Bull. Soc. Bot. Fr. **61,** Mém. **8**: 295 (1917).

[*C. caterviflora* (non N. E. Br.)—Hutch. et J. M. Dalz., F.W.T.A. **1**: 299 (1928), pro parte, quoad *Chevalier* 17783.]

[*C. strigosa* (non Prain)—Aubrév., Fl. For. Côte d'Ivoire **2**: 70, t. 151, 6–11 (1936).]

Type:—Ivory Coast, entre Soubiré et Yaou (Sanvi), *Chevalier* 17783 (P. holotype; K, isotype !).

Erythrococca pallidifolia (*Pax et K. Hoffm.*) *Keay*, comb. nov.

Athroandra pallidifolia Pax et K. Hoffm. in Engl. Pflanzenreich **4, 147, 7**: 84 (1914).

Type:—Fernando Po, Musola, *Mildbraed* 6070 (B, presumably destroyed).

Tragia vogelii *Keay*, nom. nov.

T. angustifolia Benth., in Hook., Niger Fl. 502 (1849); Pax et K. Hoffm. in Engl. Pflanzenreich **4, 147, 9**: 93 (1919); non *T. angustifolia* Nutt. in Trans. Amer. Phil. Soc., new ser., **5**: 172 (1837).

Type:—Nigeria, *T. Vogel* 108 (K, holotype !).

Euphorbia desmondi *Keay et Milne-Redhead*, sp. nov., ab *E. teke* Schweinf. ex Pax, spinis majoribus adscendentibus multo densius confertis, foliis brevioribus valde emarginatis vel 2-lobatis, cyathiis protogynis, pedicellis fructuum gracilioribus recurvatisque facile distinguenda.

Arbuscula usque ad 6 m. alta, succulenta, glabra, spinosa, trunco teretiusculo usque ad circiter 10 cm. diametro, ramis stricto-adscendentibus tandem basin versus delapsis. *Rami* non segmenti; ramuli 3–4-angulati (vel 5-angulati in specimine *Batten-Poolei*), exalati vel nonnunquam leviter alati, 1·5–3·5 cm. crassi; anguli longitudine stricti et paralleli, vix vel leviter undulati, podariis corneis usque ad 1·8 cm. discretis ornati, aculeisque binis adscendento-patentibus robustis 3–7 mm.

longis dense armati ; podarium ipsum nunc cicatrice folii delapsi suborbiculari usque ad 5 mm. diametro notatum nunc ea destitutum. *Folia* decidua, carnoso-coriacea spathulato-obcordata inferne attenuata apice valde emarginata vel 2-lobata lobis late rotundatis vel truncatis, usque ad 12 cm. longa et 6 cm. lata, margine integra. *Cyma* solitaria vel ternata supra podariis disposita ; pedunculi 2–4·5 cm. longi plerumque cyathiis binis in ramulis lateralibus 0·8 1·5 cm. longis nonnunquam cyathiis solitariis, dispositi, bracteae ovatae membranaceae apice obscure laceratae quam cyathia breviores. *Cyathia* bisexualia, protogyna ; involucrum circiter 1 cm. diametro, glandulis 5–6 transverse oblongis integris circiter 4 mm. latis fere contiguis, lobis 5 6 oblongo-ovatis laceratis ad anthesin floris feminei eos masculos claudentibus obtectum. *Flores* ♂ (*Batten-Poole* FHI 12893) pedicellis circiter 3 mm. longis, filamentis circiter 1 mm. longis, antheris circiter 1 mm. longis, squamis laciniatis circiter 2 mm. longis praediti. *Flos* ♀ subsessilis calyce brevissime 3-angulato angulis ipsis minute 2-lobulatis praeditus ; ovarium ovoideum mox trigonum circiter 2 mm. altum, stylis 3 circiter 1.5 mm. longis patentibus vel recurvatis stigmatibus minute 2-fidis coronatum. *Capsula* trigona circiter 1 cm. alta lateribus circiter 1·4 cm. latis, apice obtusa stylis persistentibus coronata, basi ad calycem accrescentem triangulatum affixa, ex involucro pedicello recurvato usque ad 1·3 cm. longo manifeste exserta ; semina ? matura) sphaerica circiter 4 mm. diametro.

Nigeria : Katsina Prov., in field about 1/6 mile from road east of culvert No. 33 3 about 33 miles from Katsina on the Kano road, 12 Dec. 1949, *R. D. Meikle* 813 (K, holotype) :—an erect bush to 4 m. high, with rather erect branching ; stems pale green with red brown spines on pale biscuit-coloured shields ; leaves pale green, obcordate ; inflorescence reddish, the cyathia with dull crimson "petals" (glands) and pale green ovary with bright red stigmata. Plateau Prov., near Jos, 1947, A. H. *Batten-Poole* FHI 12893 (K). Plateau Prov., Bargesh, 17 Dec. 1949, *Th. Monod* s.n. (K). Plateau Prov., Pedong, 18 Dec. 1949, *Th. Monod* 9709 K). Plateau Prov., road to Bauchi, 20 Dec. 1949, *Th. Monod* s.n. (K).

British Cameroons : Dikwa Div., hills above Gwoza, 780 m. alt., 5 Dec. 1954, *A. McClintock* 68 (K) :—shrub up to 6 m., with thick fleshy stems, ridged and thickly spined on the ridges ; leaves pale green, clustered at the tips of the shoots with the flowers which are also green ; stems grey, spines black or brown ; exudes much milky juice when cut.

The above description is based entirely on excellent material preserved in spirit, viz. *Meikle* 813 (holotype) and *Batten-Poole* FHI 12893 which was used for the description of the male flowers. Mr. Batten-Poole's specimen has rather more branched inflorescences and showed rather more variation in the armature than in the holotype. Unusual characteristics of this species are : —(1) the large deciduous leaves are produced only on some of the spine-shields (podarii) ; (2) the protogynous cyathia.

E. desmondi is common on rocky hills on the Jos plateau and may well have been planted where our colleague Mr. R. Desmond Meikle found it

in Katsina Province. A cutting of Mr. Batten-Poole's gathering is growing on Forestry Hill, Ibadan.

The habitat of *E. desmondi* is very different from *E. teke*, which appears to be its nearest relative and grows to a rather larger size in swamp forests in Uganda and in the Equatoria province of the Anglo-Egyptian Sudan.—

R. W. J. Keay and E. Milne-Redhead.

URTICACEAE

Urera rigida (*Benth.*) *Keay*, comb. nov.

Boehmeria (*Procris* ?) *rigida* Benth. in Hook., Niger Fl. 519 (1849).

Urera elliotii Rendle in Journ. Bot. **54** : 369 (1916) ; F.T.A. **6, 2** : 258 (1917) ; F.W.T.A. **1** : 440 (1928).

[*Urera obovata* (non Benth.)—Rendle in F.T.A. **6, 2** : 257, pro parte, quoad syn. et spec. *Don*, *Thomas* 1920, *Rowland* et *Millen*.]

Type :—Sierra Leone, *G. Don* s.n. (BM, holotype !).

Ben Lawers.*—This interesting little booklet on Ben Lawers, a property which the National Trust for Scotland acquired in 1950, has recently been published. It appears that one of the Trust's chief reasons for acquiring this natural beauty spot was to ensure the preservation of its rare alpine flora. The booklet begins with an account of the history and legend by Miss M. S. Campbell, F.L.S., then follow accounts of Ben Lawers range, the plant ecology, animals of the mountains, and ski-ing by Dr. G. R. Elles, Dr. Duncan Poore, J. Grant Roger and L. R. S. Mackenzie respectively. It ends with an account of the Garth Memorial Youth Hostel, and a bibliography. Included are coloured photographs of some of the plants growing on Ben Lawers and maps of the district.

H. S. Marshall.

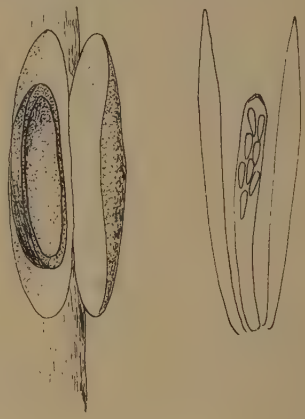
* Ben Lawers and its Alpine Flowers. A publication of the National Trust for Scotland. Pp. 56, 16 illus. and 2 maps. Edinburgh, 1955. Price 4/-.

A BRITISH STATION FOR HYSTEROPEZIZELLA VALVATA.

R. W. G. Dennis

In spite of its fibrous character and exposed habitat the common marram grass, *Ammophila arenaria* (L.) Link, is host to a remarkable number of microfungi. Many of these have already been observed in the British Isles but there are still a number known on marram in Europe but still be be found here. In 1951 the writer found on *Ammophila* in the Isle of Rhum *Chitonospora ammophilae* Bomm., Rouss. & Sacc. and *Pleospora multiseptata* Starback, both new to Britain and the latter a new host record. The interesting Discomycete *Hysteropezizella valvata* (Mont.) Nannf., hitherto known from the French and Belgian coasts, has now also been found on marram in the northwest Highlands.

This species has been well studied by von Höhnel who pointed out its true position in the Dermateaceae and referred it to his genus *Hysterostegiella*, which Nannfeldt has reduced to synonymy under *Hysteropezizella* von Höhnel. A brief description of the British material follows.



Hysteropezizella valvata on *Ammophila arenaria*, Sandwood Bay. Left: apothecium exposed by dehiscence of the covering discoloured epidermal lid × 30. Right: ascus and paraphyses × 660.

Hysteropezizella valvata (*Mont.*) *Nannf.* in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 4, 8, p. 115 (1932).

Stictis valvata Mont. in Ann. Sci. Nat. Bot. Ser. 2, 6, p. 337 (1836).

Naevia valvata (Mont.) Fr. Summa Veg. Scand. p. 373 (1849).

Hysterostegiella valvata (Mont.) von Höhn. in Sitzb. Akad. Wiss. Wien, Math.-nat. Kl. Abt. I, Bd. 126, p. 313 (1917).

Apothecia elliptical, up to 1 mm. long, immersed in mesophyll of dead leaves of *Ammophila arenaria* and covered at first by an elliptical gray patch of discoloured host epidermis which is thrown off at maturity to expose the light gray disc. Excipulum dark gray, pseudoparenchymatous below with parallel hyphae towards the margin; asci cylindric-clavate, 8-spored, 45–55 × 5μ, the small pore blue in Melzer's reagent; ascospores biseriate, fusiform-clavate, 6–7 × 1·5μ; paraphyses lanceolate, 5μ wide, sharp-pointed and exceeding the asci by up to 20μ.

British collection: Sandwood Bay, 6 miles S. of Cape Wrath, Sutherland, 20.ix.1954.

Microfungi associated with the *Hysteropezizella* in this collection were: *Mycosphaerella lineolata* (Rob. & Desm.) Schroet., *Anthostomella lugubris* (Rob. & Desm.) Sacc., *Chitonospora ammophilae* Bomm., Rouss. & Sacc. and *Sporodesmium myrianum* Desm.

NOTES ON CASSIPOUREA AUBL. IN AFRICA.

JOHN LEWIS

The work of A. H. G. Alston on the genus *Cassipourea* [K.B. 1925 : 241–276 (1925)], while it did much to bring order to the chaos previously distributed in the four genera *Weihea*, *Lasiopetalum*, *Cassipourea* and *Dactylopetalum*, suffered at the species level through the lack of sufficient gatherings of the species he included. Study of a number of these species has been necessary for the Flora of Tropical East Africa and the discovery in recent material of failure in the correlation of characters and of variation beyond the previous circumscription of species causes a number of reductions to synonymy.

The author wishes to express his gratitude to the authorities of herbaria who have sent specimens on loan to Kew for this study, namely :— Professor H. Humbert, Muséum National d'Histoire Naturelle, Paris, Prof. Dr. R. E. G. Pichi-Sermolli, Herbarium Universitatis Florentinae, Firenze, and Dr. P. J. Greenway, East African Herbarium, Nairobi. I have been greatly assisted during the period of this study by conversations with my colleagues at Kew, both directly regarding the variation of plant life in Africa, and generally, concerning the species concept. I gratefully acknowledge this help, and must mention in particular, Messrs. A. A. Bullock, J. P. M. Brenan and J. H. Hemsley, but this is not to be taken as inferring that these gentlemen either share any of the responsibility in the making of the observations reported or necessarily agree with the conclusions reached.

Cassipourea SUBGENUS **Weihea** (*Spreng.*) *Alston.*

C. euryoides *Alston* in K.B. 1925 : 254 (1925).

C. honeyi Alston in K.B. 1925 : 254 (1925).

Although distinguished in the past by the nature of their leaf-margins, their leaf-widths, petiole-lengths and geography, these differences are not confirmed by recent material and, therefore, these two entities are not considered to be specifically distinct. While the type of the latter, *Honey*, 757 (K, !) from Portuguese East Africa, bears some leaves which are widely and shallowly dentate and the majority of the material of *C. euryoides* from Kenya has entire leaves, recent specimens from Kenya (e.g. *Graham* 1627 ; K ! EA !) while having most of their leaves quite entire, do possess a few which show the minimum amount of division of some of the leaves of the holotype of *C. honeyi*. Similarly regarding leaf-width : the type of *C. honeyi* has narrow leaves, up to 2·7 cm. wide ; those of *C. euryoides* are usually wider, up to 3·5 cm. wide (in leaves of the same length, c. 7 cm.). In the recent Kenya material, however (e.g. *Moggridge ;* 399 K !, EA !) leaves characteristic of *C. euryoides*, up to 7·5 × 3·8 cm. or 6 × 3·0 cm. exist with the margin-division characteristic of *C. honeyi*. Again, a specimen, *Graham* 1627 (EA !) from Kenya has leaves some of which are divided in the manner of those of *C. honeyi*, and such leaves are also of the narrow shape characteristic of the southern element.

The distinction in length of petiole, stated to be that between 4 mm. in *C. euryoides* and 6 mm. in *C. honeyi*, is not maintainable as specific,

especially as petioles 5 mm. long occur on the holotypes of both. It is judged best to regard the one specimen, *Honey* 757 as an extreme example of *C. euryoides* in relative narrowness of leaf, this name, as it is of the more widespread and well known form, being chosen for the species.

More material from the southern part of the range is required ; the degree to which it confirms or denies the discontinuity in leaf shape (not leaf-margin division) will decide the status of Honey's plant within the species. The species is known from the coastal forests of Kenya at 80–400 m. altitude, and from the Siluvu Hills, Portuguese East Africa.

C. malosana (*Baker.*) *Alston* in K.B. 1925 : 258 (1925). Type : Nyasaland, near Zomba, Mt. Malosa, *Whyte* (K, holo. !).

Weihea malosana Baker in K.B. 1897 : 267 (1897).

W. elliottii Engl. in Engl. Bot. Jahrb. 40 : 52 (1907). Type : Kenya, Nairobi District, Mosigi, *Elliott* 145 (K, iso. !).

W. eickii Engl. l.c. : 52 (1907). Types : Tanganyika, W. Usambaras, plateau near Kwai, *Eick* 137 (B, syn. destroyed ; BM, photo-syn. !), *Albers* 19 & 198 (both B, syn. destroyed) and same locality *Drummond & Hemsley* 1353 (K, EA, etc., neo. !).

W. avettae Chiov. in Ann. Bot. Roma 9 : 321 (1911. Type : Ethiopia, Lutoto Hills, little Cavanna valley, *Negri* 262 (FI, holo. !).

W. salvago-raggei Chiov. in Ann. Bot. Roma 9 : 62 (1911). Type : Eritrea, Acchelé Guzai region, Amba Debra, *Poppi* 2577 (FI, lecto. !).

W. abyssinica Engl. in Engl. Bot. Jahrb. 54 : 362 (1917). Type : Eritrea, Kohaito plateau, *Schweinfurth* 595 (B, holo. destroyed ; BM, photo-holo. !).

W. ilicifolia v. Brehmer in Engl. Bot. Jahrb. 54 : 362 (1917). Type : ? Tanganyika, between Lakes Tanganyika and Nyasa, Mt. Mfimbwa, *Fromm* 230 & 232 (B, syn. destroyed).

Cassipourea elliottii (Engl.) Alston in K.B. 1925 : 260 (1925).

C. eickii (Engl.) Alston in K.B. 1925 : 259 (1925).

C. abyssinica (Engl.) Alston in K.B. 1925 : 253 (1925).

C. avettae (Chiov.) Alston in K.B. 1925 : 253 (1925).

C. salvago-raggei (Chiov.) Alston in K.B. 1925 : 254 (1925).

The variation within this species as revealed by recent material from East Africa, where it is called *C. elliottii*, has made clear the lack of distinctness of a number of other entities. The synonymy will be discussed from this point of view notwithstanding the fact that the resulting species must take the earliest name, which is that that has been applied to a solitary Nyasaland gathering.

The supposed distinction between *C. malosana* from Nyasaland and *C. elliott* was mainly based on the glabrous nature of the former's ovary ; this character is however no longer valid since glabrous ovaries do occur in the more northerly element. The original description of the leaves of *C. malosana* as " oblong " is quite misleading, those of the type specimen have the characteristically elliptic shape of *C. elliottii*. These two entities are too much alike to be considered even as distinct varieties. *C.*

ilicifolia is a previously accepted synonym of our present species and is included here without question ; no material of it survives today.

C. elliottii and *C. malosana* are distinguished from *C. abyssinica*, *C. avettae* and *C. salvago-raggei* in Alston's key by the division : " leaves longly acuminate ", " leaves scarcely acuminate " ; the descriptions also indicate differences in leaf size. *C. elliottii* is described as having glabrous leaves but this is in error, even some of those of the type specimen, *Elliott* 145 bear a sparse indumentum below of long appressed hairs.

The differences in size and in the shape of the apices of the leaves in *C. elliottii* and *C. abyssinica* have not remained correlated with the geographical distribution, and some specimens cannot now be characterised by these differences. An interesting gathering from Abyssinia, Galla Pass, *Gillett* 5148 (K, EA, FI) has both narrow (7·5 × 2·5 cm.) distinctly acuminate leaves and broad (7·6 × 3·8 cm.) scarcely acuminate ones. These may not have come from the same individual, but the broad-leaved part is indistinguishable from specimens of *C. elliottii* from Kenya, for example *Bally* 6529 from the Ngong forest. This latter specimen has leaves up to 8·8 × 3·8 cm. and many other East African specimens now exist in which the size exceeds that previously thought to be the characteristic maximum (3·35 × 2·25 cm.) for the East African material. From the range of material available it is concluded that *C. abyssinica* is merely an extreme form of *C. malosana* (*C. elliottii*) in relative acuminateness of leaf-apex, which occurs in the northern part of the range of the species. In the type locality of *C. elliottii*, near Nairobi, the tree is a tall member of the forest canopy, in Uganda, Abyssinia & Somaliland the specimens previously referred to *C. abyssinica* are medium sized trees of the understorey in Juniper or Podocarpus forest ; but smaller specimens with foliage typical of *C. malosana* (*C. elliottii*) in the strict sense are known in East Africa from lower altitudes, not in forest canopy, so habit and habitat do not constantly distinguish these two entities.

The inclusion in *C. malosana* of *C. abyssinica* brought into question its two near neighbours geographically, *C. avettae* and *C. salvago-raggei*. The three have been distinguished by combinations of the differences in number of flowers, length of pedicel, shape and margin of leaf. These differences[1] are not found to be so combined. *C. avettae*, as represented by its type specimen, *Negri* 262 from Ethiopia, certainly has pedicels almost twice as long as are found on specimens of the other two. *C. salvago-raggei*, described by Chiovenda as having " flowers densely fasciculate " and by Alston as having " flowers numerous ", has on the type specimen (3–) 4–8 (–10) flowers ; in the other two 1–5 flowers was the rule. There is now however, a specimen, *Giordano* 2457 (FI. !) from Ethiopia, Galla Sidama, Dalli forest which combines short pedicels (3 m.) with numerous flowers (3 to at least 10). The leaf shapes are

[1] They were used by Alston in his key (translated) as follows :—

Flowers 1–5 :
Pedicels c. 7 mm. long ; leaves elliptic-oblong, margin deeply dentate (Ethiopia) 7. *avettae*
Pedicels c. 3·5 mm. long ; leaves elliptic, margin dentate to subentire (Eritrea & British Somaliland) . . . . . 8. *abyssinica*

Flowers numerous ; pedicels up to 2 mm. long ; leaves elliptic, margin slightly dentate (Eritrea) . . . . . 9. *salvago-raggei*

insignificantly different ; all three species have narrowly to almost broadly elliptic leaves. The suggestion that those of *C. avettae* are somewhat oblong is belied by the holotype, which is the only gathering. The diversion of the leaf margin is very much less in some specimens of *C. abyssinica* but more recent material, corresponding to *C. abyssinica* in all else, has some leaves at least as deeply serrate as those in *C. avettae*. *Gillett* 5148 (see above) shows the whole range of leaf-margin variation in one gathering. *Parry* 65 from Mt. Meru in Tanganyika, clearly *C. malosana* (*C. elliottii*), has some leaves both large and with margins deeply serrate as in *C. avettae*.

We may conclude that these three species as accepted by Alston are more correctly to be regarded as infraspecific variants, and in fact as scarcely of varietal status. *Negri* 262 is certainly distinct within the whole species (*C. malosana*) in the possession of longer pedicels than the remainder.

The entity described as *Weihea eickii* from the W. Usambara mountains falls clearly into this species. No distinguishing diagnosis is given with the original description although *W. elliottii* is described in the same article. The two descriptions do describe some organs in common and some few differences[2] can be noted. The differences concerning the leaves have been invalidated by variation recently discovered in *Cassipourea elliottii* and the same is true of the 4-lobed calyx given as characteristic of *C. eickii*. The original material of *C. eickii* has been destroyed but Messrs. R. B. Drummond and J. H. Hemsley visited the type locality, a plateau near Kwai at 1600 m. in 1953 and made an excellent gathering from a solitary small tree which they found there. This specimen, *Drummond & Hemsley* 1353, of which many duplicates will be available, is clearly nameable as *C. eickii* even although none of its leaf-blades are near the maximum in length that Engler reports and its petioles only reach his lower limit of length. The fruits are only about 6 mm. in maximum length which contrasts with the 8 mm. of the description. Most interesting is the occurrence in the flowers of both 4- and 5-partite calyces. The ovaries are in some cases glabrous as required by the description of *C. eickii* but in many cases they are not, and most of the fruits possess that tuft of white hirsute hairs around the base of the style which the experienced botanist soon learns to associate in this subgenus with *C. elliottii*.

It is recommended that *Drummond & Hemsley* 1353 should be accepted as the neotype of *C. eickii* but that this entity should not be regarded as specifically distinct from *C. elliottii*, and hence from *C. malosana*.

C. ruwensorensis (*Engl.*) *Alston* in K.B. 1925 : 263 (1925). Type : Belgian Congo, West Ruwenzori, Butagu valley, *Mildbraed* 2515 (? BR, syn.) and Fort Beni *Mildbraed* 2245 (? BR, syn., BM, photo-syn. !).

Weihea ruwensoriensis Engl. in Mildbr., Wiss. Ergeb. der Deutsch. Zent.-Afr. Ex. 1907–8, 2 : 579 (1913) ; Engl., Bot. Jahrb. 54 : 364 (1917).

W. boranensis Chiov. in Cufodontis, Miss. Biol. Borana, Bot., Angiosp.-Gymnosp. 143 & photo. 144 (1939). Type : Ethiopia, Mega, *Cufodontis* 644 (FI, holo. !).

[2] Even if the differences embodied in Engler's two descriptions were still demonstrable, they would not warrant specific rank in this group.

Weihea boranensis was diagnosed as differing from *Cassipourea* (*Weihea*) *ruwensorensis* only in the shape of the leaves. The description also states that it possessed fewer flowers per inflorescence than the average in this species. A specimen recently gathered from the same locality, 14 Nov. 1952. *Gillett* 14265, matches the holotype of *W. boranensis* very well indeed. Since Dr. Cufodontis' specimen is recorded as coming from a tree near the British Consulate, and since Mr. Gillett's notes (which he has confirmed verbally) include " one tree growing in the Consulate grounds . . . . ", this recent specimen is very probably from the same individual as the type specimen. The distinctive appearance of these two specimens arises from their having (nearly) all their leaves broadly elliptic with acuminate apices, rounded below to cuneate bases. This form of leaf is, however, not uncommon in specimens of *C. ruwensoriensis* from Uganda although such other specimens show a range of variation exceeding that of the Ethiopian material. *Gillett* 14265 has up to four flowers per inflorescence which is similarly within the species' range. It is preferred not to accord specific rank to these Mega specimens ; Mr. Gillett notes that other similar trees occur in nearby forests and if further gatherings agree in their distinctness from typical *C. ruwensoriensis* they could be suitably recognised as a variety of our species.

Note. It is the author's unconfirmed belief that among the " species " of the subgenus *Weihea* there lurks a large species complex such as is postulated below in the subgenus *Dactylopetalum*. See the note at the end of the article regarding the necessarily tentative nature of the present treatment.

Cassipourea SUB-GENUS **Dactylopetalum** (*Benth.*) *Alston.*

C. gummiflua *Tul.* in Ann. Sci. Nat., sèr. IV, 6 : 123 (1856).

[1] *Dactylopetalum gummifluum* (Tul.) Jackson in Ind. Kew. 2 : 709 (1893).

Richea gummiflua Baill., Hist. Pl. Madag., Atlas 3 : t. 323 (1894).

[2] *D. sessiliflorum* Benth. in Journ. Linn. Soc. 3 : 79 (1858).

[3] *C. mannii* (Hook. f. ex Oliv.) Engl. in Engl. Bot. Jahrb. 54 : 369 (1917).

[4] *D. mannii* Hook. f. ex Oliv. in Fl. Trop. Afr. 2 : 412 (1871).

[5] *C. verticillata* N. E. Brown in Kew Bull. 1894 : 5 (1894).

[6] *D. verticillatum* (N. E. Brown) Schinz in Bull. Herb. Boiss. 5 : 866 (1897).

[7] *C. verticillata* f. *decussata* Engl. in Engl. Bot. Jahrb. 54 : 369 (1917).

[8] *C. ugandensis* (Stapf) Engl. in Veg. Erde IX, Pflanzenwelt Afr. 3, 2 : 673 (1921).

[9] *D. ugandense* Stapf in Journ. Linn. Soc. 37 : 515 (1906).

[10] *C. redslobii* Engl. in Engl. Bot. Jahrb. 54 : 368 (1917).

[11] *C. rogersii* (S. Moore) Alston in Kew Bull. 1925 : 272 (1925).

[12] *D. rogersii* S. Moore in Journ. Bot. 59 : 228 (1921).

[13] *C. nodosa* Alston in Kew Bull. 1925 : 273 (1925).

[14] *C. glabra* Alston in Kew Bull. 1925 : 274 (1925).

[15] *C. paradoxa* Alston in Kew Bull. 1925 : 275 (1925).

The above eleven taxa have been distributed previously in nine species as indicated by the indentation. Further references to them will be found in the text below ; they were all included in Alston's monograph. These " species " are more clearly distinguishable by their geographical location than by their morphological characters. The last three are still only represented by their original gatherings ; few specimens are known of some of the others ; *C. redslobii* and *C. ugandensis* have become fairly widely known. The variation found in these latter two, especially that of *C. ugandensis*, provides a great deal of the evidence upon which this large reduction to synonymy is based.

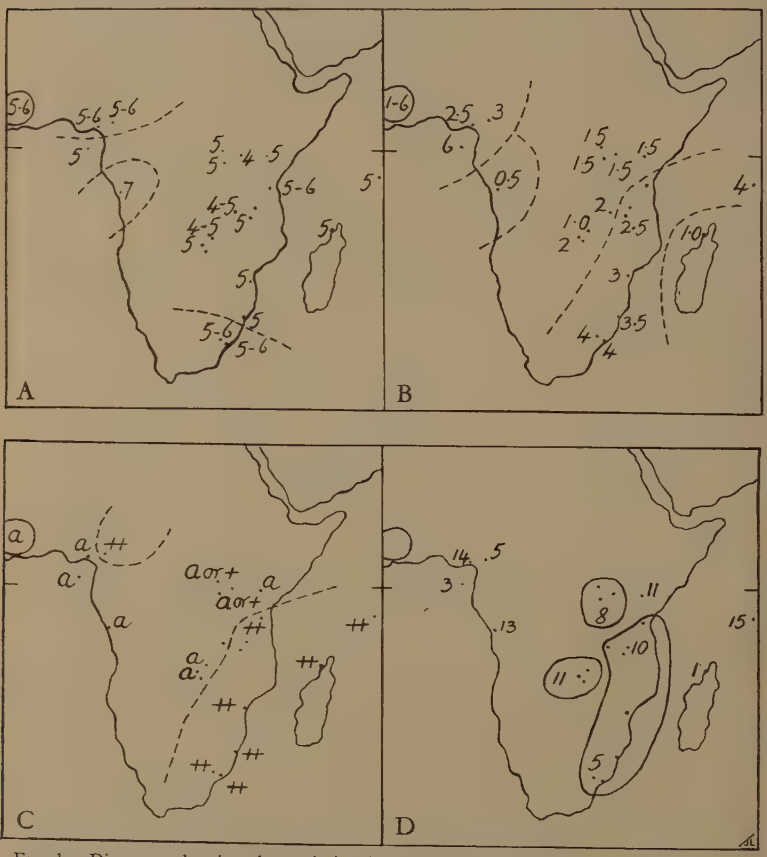


FIG. 1. Diagrams showing the variation in the characters of certain members of the subgenus *Dactylopetalum*. The broken lines indicate breaks in affinity on the basis of the character being analysed. The symbols inset in the circles are those of *C. paludosa* from Sierra Leone, *Deighton* 1743 ; see note on page 159.

A. The number of calyx-lobes.

B. The length of the pedicels (maximum in mm.).

C. The indumentum of the ovary : a—glabrous ; +—with a few hairs towards the apex ; ++—pubescent above.

D. Key to the "species" shown ; numbered according to the list on the previous page. Individual specimens can be identified by comparison with Fig. 2.

The nine so-called species are not equally closely related and in explaining the above synonymy the closer unions will be discussed first. Three groups of " species " will thus be formed. Following this, the interrelationship of these groups and of the remaining synonyms will be considered, especially to decide whether any nameable infra-specific taxa exist.

The " *mannii* " group.

C. mannii (Hook. f. ex Oliv.) Engl. Type : St. Thomas island, summit of the peak, *Mann* 1071 K, holo. !).

C. glabra Alston. Type : Southern Nigeria, Oban, *Talbot* 1757 (K, holo. !).

These two West African taxa were distinguished as species by the number of parts in the flowers, the length of the stamens, the lengths of the pedicels and petioles, the size and detailed shape of the leaves and in the key only, by the lack in the latter of the tomentum of the former's calyx-lobes.

The difference in the number of flower parts is not a constant feature. The flowers of *C. glabra*, said to have 5-lobed calyces and 10 stamens, do have these numbers but 6-lobed calyces with 12 stamens have also been found. The flowers of *C. mannii*, said to be 4-merous, are not found to be so ; four flowers from the type specimen had 5 calyx lobes and 10 stamens. The " tomentum " on the calyx lobes of *C. mannii*, given as a character in Alston's key to the species is belied by his remark " calyx utrinque glaber " in the description in the text, in any case the appearance which some of the lobes have on the isotype at Kew is not uncommon in members of the subgenus. The buds when closed have the calyx lobes " sealed " together apically by a plug of gummy substance which is left attached to one or more of the lobes after anthesis as a yellow concretion. The act of separation draws threads of this material away from the small amount that is left on some of the lobes. This gives the appearance, under a low power lens, of the lobes having a pubescent tip. In any case, traces of the results of the same phenomenon can be seen on the holotype of *C. glabra*.

The pedicel lengths are given as up to 4·5 mm. in *C. mannii* and as 2·0 mm. in *C. glabra* ; true as these figures are in part the distinction loses its significance when a pedicel scarcely more than 3 mm. long is found on the type of the former and a few at least 3 mm. long on the type of the latter. The leaves of *C. mannii* are certainly rounded below but the actual base is very shortly cuneate in the same way as the bases of the leaves of *C. glabra* are less shortly so. The apices of the leaves of the type of *C. mannii* are all broken off so that the description of them as " obtuse to subacute " is invalid; one leaf on the type of *C. glabra* (which otherwise has clearly acuminate leaves) is slightly broken at the tip and matches in appearance those broken to the same degree on Mann's plant. Although the leaves are, on the whole, smaller in *C. mannii*, leaves of 10 × 5 cm. can be found on both type specimens and it is the loss of the tips of the leaves of Mann's plant which gives them the appearance of broader ellipticity.

All that remains to be considered is the difference in the exsertion of the stamens. Those of *C. glabra* are about twice as long as the calyx which is

the usual condition in the subgenus, in Mann's plant they are scarcely longer than the calyx although the thecae have opened and the pollen has been visibly discharged. In view of the otherwise close affinity of these two plants it is preferred to regard this behaviour of the stamens of the type of *C. mannii* as anomalous. It appears very probable that when a branch is collected bearing half opened flowers, any residual energy will be expended in " opening " the anther thecae (which contain mature pollen before the onset of anthesis) or that drying may cause them to burst, but that the extension of the filaments would not continue.

The opinion that these two taxa are conspecific was shared with the present author by E. G. Baker (Cat. Talb. Niger. Pl. : 127), who, in 1913 identified Talbot's plant as *D. mannii*.

The " *verticillata* " *group.*

C. verticillata N. E. Brown. Types : South Africa, Natal, near Pinetown, *Wood* 3876 (K, syn. !) and near Durban, *Wood* 4619 (K, syn. !).

C. verticillata f. *decussata* Engl. Type : Tanganyika, Ukinga, Manganyema mt., *Goetze* 1215 (B, holo. destroyed).

C. redslobii Engl. Types : Tanganyika, Unguru, near Manjangu, *Bittkau in Redslob* 2981 (B, lecto. destroyed ; BM, photo-lecto., showing drawings of dissections !) and *Redslob* 2907 (B, syn. destroyed).

C. paradoxa Alston. Type : Seychelles, Botanic Station, *Dupont* s.n. (K, holo. !).

C. verticillata and *C. redslobii* were distinguished in 1925 by the arrangement of the leaves, their size, degree of acuminateness, and the nature of their margins, by the lengths of the pedicels being 4 mm. in the former and 5 mm. in the latter, and to some extent by the number of parts in the flowers. The former entity was said to have 6–7 lobed calyces, the latter only 5–6-lobed ones.

The original gatherings of *C. verticillata* include *Wood* 3876 which has been found to have only 5- and 6-merous flowers. A specimen from Natal, Oribi Gorge, *McClean* 468 (K, !) which has been named *C. verticillata* (probably on geographical grounds) has leaves characteristic of *C. redslobii* in both nature and arrangement, and also has 5- and 6-merous flowers (at the same node). A specimen of *C. redslobii* from Portuguese East Africa, *Honey* 716 (K, !) cited by Alston, has pedicels scarcely exceeding 3 mm. in length and, like other specimens from even farther north, has some leaf margins slightly sinuate as in Wood's typical specimens of the southerly *C. verticillate*. The slight difference in leaf-size loses its significance when a reasonable number of specimens are viewed together ; the tendency of the more northerly *C. redslobii* to have less acuminate leaves is too slight to be considered as a specific distinction.

It remains to consider the difference in the arrangement of the leaves. The type material of *C. verticillata* at Kew and a further authentic specimen, *Wood* 662 at the British Museum clearly show leaves in fours and threes at the nodes and Brown follows his description in 1894 with the remark that " this species is readily distinguished from all known species by its verticillate leaves, which are sometimes 3, sometimes 4, in a whorl". However, seed from the Wood specimens was set in 1892 in the Natal Botanic Gardens and the trees came into flower in 1898 ; the plant was

figured in Natal Plants 3 : t. 276 in 1902 at which time Wood comments " we have seldom found 4 leaves in a whorl, but very frequently only 2, and occasionally branchlets are found on which the leaves are all opposite ". The opinion of Engler that a plant with decussate leaves from Nyasaland could be considered as a form of *C. verticillata* supports the present author's opinion that the two entities under discussion are conspecific.

The original and only specimen of *C. paradoxa* (which possesses decussate leaves), was described as differing from both *C. verticillata* & *C. redslobii* by having 15 stamens (three times the number of calyx-lobes) whereas they had 10–12 (twice the number of calyx-lobes) and in that it had the " *ovarium apice leviter pilosum* " whereas they had " *ovarium (omnino) breviter pubescens* ". The original description of *C. paradoxa* records that although 10 of the 15 stamens were inserted on the disc, 5 were outside it ; since in all other cases in the subgenus the stamens are on the disc and since the petals, which are inserted outside the disc, have long claws that are almost as narrow as the filaments, it is probable that this diagnosis was in error. The holotype specimen has been re-examined and in the several flowers dissected the stamens number ten (twice the number of calyx lobes as is typical in the subgenus) and they are inserted on the margin of a more or less lobed disc. The flowers on this specimen, *Dupont* s.n., contain ovaries which are just commencing to swell into fruits. They are larger than those of young flowers of *C. verticillata* and *C. redslobii*, but ovaries of the same size may be found on some sheets of the latter, and *Honey* 716, an authentic specimen (cited by Alston) of *C. redslobii*, has, on the one sheet at Kew, flowers with smaller ovaries and fruits which are much larger. The indumentum on all the ovaries in this group is of hairs of the same type, varying only in density, which depends in part on the degree of swelling of the ovary. As to the distribution of indumentum, the variation in the degree of calyx-adnation reveals more or less of the ovary surface and the hairs on the ovaries of *C. verticillata* and *C. redslobii* are as much confined to the upper part as they are in *C. paradoxa*. The fruits of *Honey* 716 are pubescent only apically, the ovaries in the young flowers on the same sheet are slightly more longly so in their upper halves and the intermediate sized ovaries of Dupont's specimen are intermediate also in the distribution and length of their hairs. It is clear that this latter specimen is no more than an infraspecific variant ; as it comes from the Botanic Station in Seychelles the suspicion arises that it was introduced from the mainland.

The " *ugandensis* " group.

C. ugandensis (Stapf) Engl. Type : Uganda, Toro district, Kibale forest, *Dawe* 499 (K, holo. !).

C. rogersii (S. Moore) Alston. Type : Belgian Congo, Elisabethville, *Rogers* 26209 (BM, holo. ! K, iso. !).

The material from Uganda is vary variable. The type bears no dissectable flowers but Dr. Stapf reports that they were subsessile and 5-merous ; he does not mention whether the ovary bore any hairs or not. A specimen from Toro District, on the Ruimi river near Rwagimba, *Eggeling* 5424 (K, !, EA, !) has 5-merous calyces and although having leaves

larger in size, matches the holotype in other respects ; it has ovaries which are glabrous or bear a few short hairs at the base of the style. A pair from the Namalala forest in south east Uganda have ovaries varying in the same way ; on *Fyffe* 75 they are perfectly glabrous while on *Fyffe* 29 they show a few short white hirsute hairs at the apex and in the sutures. This pair have 4-merous calyces and relatively broader smaller leaves. A specimen, *Eggeling* 4204 (K, !) from Kayonzo forest, S.W. Uganda, has foliage which is intermediate both in general and detailed shape, bridging the gap between the holotype and the Fyffe pair by having leaves either rounded or cuneate below[3].

The type specimens of *C. rogersii* have been well matched recently by two gatherings from N. Rhodesia, Solwezi river, *F. White* 3241 & 3218A, which have a few leaves that lack that acuminateness which could be used to delimit this taxon previously. *F. White* 3241 has up to sixteen flowers per leaf axil which is a great increase on the seven previously reported as maximal for *C. rogersii* ; fifteen per axil occur in *C. ugandensis*. *C. rogersii* has glabrous ovaries, so the occurrence of glabrous ovaries in the Uganda material as mentioned above has broken down another previous difference. The geographical separation of the past has been shaken by a specimen from Kenya, Aberdare Mts., *Logie in Bally* 7972 which has the leaf margin subcrenate above, matching *C. rogersii* more than *C. ugandensis* ; the leaf shape is narrowly elliptic and as in the White pair, some of the leaf apices are scarcely acuminate. This specimen has been called *C. redslobii*, presumably mainly on geographical grounds, but it has quite glabrous ovaries. The two taxa under discussion are judged to be cotaxonomic at least at the species level. It is noteworthy that Mr. White records that his specimen from N. Rhodesia gallery forest had its roots in the water of the river ; in Uganda the plant frequents swamp forest.

A specimen, *Ujor in FHI* 30415, from the Bali-Ngemba forest Cameroons, has been determined as *C. ugandensis* ; it hardly fits well here especially on account of its ovary-indumentum. The specimen shows fruits which in the sparse puberulence of their upper quarters match those of *Honey* 716 and *Lynes* 25 (*C. verticillata* in the wide sense), and on the whole the " *verticillata* " group would be the best place for it in the present system. Its affinity will be discussed further below.

The remaining synonyms.

C. gummiflua Tul. Type : Madagascar, Nossibé island, ? Lokobe [Loucoube] *Boivin* (P, holo. ! ; K, ? iso. !).

Dactylopetalum sessiliflorum Benth. Type : Madagascar, Nossi-bé island, *Boivin* (K, holo. ! ; P, ? iso. !).

There has been general agreement that *D. sessiliflorum* is a synonym of *C. gummiflua* at least at the specific level and the type specimens confirm thus. The Paris specimen has some of its leaves more acuminate above ; otherwise they are almost identical. Bentham's holotype, at Kew has " Nissobé " written on the sheet ; Tulasne's, in Paris, bears two labels, a partly printed one with " Madagascar. (Noss Bé) " and a handwritten (collectors) one stating " Crete du Loucoubé " and, lower down,

[3] These leaf-shapes are exemplified in Fig. 2, p. 156.

" Nossi-bé ". It seems likely that the Kew sheet was distributed as a duplicate of the other.

These specimens are distinguished from those nearest to them on the mainland coast by their subsessile flowers (pedicels not more than 1 mm. long) ; that is from those of *C. verticillata* in the wide sense which have pedicels 2·5 to 5·0 mm. long. The more inland *C. rogersii*, although having pedicels only 1 mm. long, has glabrous ovaries, while those of the *Boivin* specimen at Kew are shortly hirsute above in common with those of *C. verticillata* and *C. redslobii*. The leaves of the Madagascan species are of the shape common to *C. rogersii* and *C. redslobii*, narrowly elliptic, cuneate to slightly rounded below, apex sub-acuminate or acuminate and the margin entire or shallowly sinuate above to bluntly and shallowly serrate above.

C. nodosa Alston. Type : Angola, Santo Antonio do Zaire, *Gossweiler* 8759 (K, holo. !, BM, iso. !).

Examination of the type specimens reveals that the author's description does not fully cover the variation exhibited. The calyx is reported as 5- or 6-merous and the stamens as numbering 15–18 (three times the number of calyx-lobes, which would be unique in the subgenus). Eight buds were dissected from the Kew sheet and three from that in the British Museum herbarium ; the numbers of parts are shown in the following table.

Kew	B.M.	Total	Calyx-lobes	Petals	Stamens		Ovary locules
					Anthers	Filaments	
4	2	6	7	7	14	14	2
1	1	2	7	7	14	14	3
1	—	1	7	6	13	13	2
1	—	1	8	8	14	14	2
1	—	1	8	8	16	14	2

The 7-lobed calyces were more or less regular but the 8-lobed ones were clearly not so, having a deeper division between one pair of lobes adjacent to a less deeply divided pair. The 6-petaled flower with 13 stamens is an anomaly ; there was however no doubt that this was observed correctly since this was in a closed bud and there is no question of parts having fallen. The most curious case is the last where two filaments were branched ; the paired anthers were not appreciably smaller than usual ; again this was a very young bud, the filaments being only about twice as long as the anthers.

The complex as a whole.

We are now in a position to compare the inter-relationship of the above five entities, the three groups and the two " species ". Study reveals that the characters which have been used to distinguish the species in the past, even apart from those which have been denied their validity in the forma-

tion of the groups, have much weaker correlation than has been thought. The characters that remain to be considered are : length of pedicel ; shape of leaf, in general and in detail ; the presence or absence of an indumentum on the ovary and the number of flowers. The following table will make clear the degrees of correlation between these characters. The " *ugandensis* " group, as it is more variable than the others, is split up here, in order to avoid the possibility of combination obscuring correlations involving the smaller entities within it, and *Ujor in F.H.I.* 30415 is segregated from the " *verticillata* " group for the same reason.

	(1) Number calyx-lobes	(2) Pedicel length (mm.)	(3) Ovary indumentum (on upper half)	(4) Leaf shape	(5) Number of flowers per axil
" *mannii* " group ...	5–6	2·5–3	absent	broad	16–18
" *verticillata* " group	5–6(?–7)	2–4	present	both	5–20
" *ugandensis* " group :					
in Uganda	4–5	1·5	absent or slight	both	3–15
C. rogersii	4–5	1–2	absent	narrow	7–16
Ujor in FHI 30415	5–6	3	present	broad	c. 7
C. nodosa	7 (–8)	0·5	absent	broad	10–40
C. gummiflua	5	1·0	present	narrow	c. 12

The differences in the two leaf shapes are made clear below and are recognisable in Fig. 2. The ovary in all the plants of this group is only hairy above (to be contrasted with *C. barteri* which has a completely hairy ovary) ; the variation in the indumentum is not only a matter of the differences in density, but the words "slight" or "present" indicate the difference sufficiently for the purpose of this table.

The greatest correspondence of character-differences shown in this table is that concerning *C. nodosa*, in which 7 (–8) calyx lobes, very short pedicels and a large number of flowers are found together. At this point the author's views on the method of taxonomy especially influence the decision to be made. *C. nodosa*, as known from the one specimen, certainly shows a range of variation in these three characters which differs from that shown by the remaining material. Botanists who adopt a more or less strictly empirical view will no doubt continue to treat it as an species in view of the variation found in the remaining plants. Here, however, an alternative method of taxonomy will be adopted. The author

has given recently in *Taxon an analysis of the influence on an author's taxonomic method of his assumptions regarding the variability of the population from which an herbarium sample comes. The application of this to his present decision on *C. nodosa* is given there as an example. For the present, it is accepted as axiomatic that the probable variation within the population from which the type specimen of *C. nodosa* was collected must be allowed for in deciding its status.

The number of flowers in this group of plants varies from 3 to 20 apart from *C. nodosa* which has 10–40, but this specimen is a much older piece of stem, being the only gathering with a diameter, in part, greater than 4 mm. ; just below the node bearing 40 flowers (or pedicels), the stem is 6 mm. in diameter. In a species such as this, where the nodes bear flowers perennially, the number of flowers is a function, at least in part, of the age of the stem. In a similar way the length of the pedicel is, in part, a function of the maturity of the inflorescence. The type specimen of *C. nodosa* bears only the youngest of buds, and, as in this subgenus the pedicels increase in length during development, they are considered to be in the shortest condition found in the group because of their extreme youth. As far as *C. nodosa* is concerned the combination of the three characters is judged to be fortuitous, two of them resulting mainly from the coincidence of very young flowers on an old stem.

With the few specimens available it may be very difficult to distinguish developmental state from genetic response ; the length of the pedicels is a case where this difficulty occurs. While *C. nodosa* is here considered to be showing a developmental aspect in having extremely short pedicels, the lengths of this feature in the remaining members of the group cannot be explained by this means alone. From the few specimens which show pedicels at different stages it is concluded that they increase in length until the flower is fully mature and suffer a slight decrease when fruit formation occurs but that the consistent difference between the pedicel lengths in the "*verticillata*" group and the "*ugandensis*" group, for example, must be judged as taxonomically (genetically) significant, although but slightly so.

The number of calyx-lobes in *C. nodosa* remains to be considered on its own merits. In a subgenus where the basic floral number varies from 4–6 (the 7-merous nature of *C. verticillata*, reported by Alston, has not been confirmed), the rare occurrence of 7 (–8) hardly warrants much interest ; it is judged best to place this plant as a form within the "*mannii*" group which it resembles in characters (3) and (4) of the table and which it is also near geographically.

The remaining correlations shown by the table are slight, and different groupings can be made on the basis of different correlations. To see if it will assist in deciding which groupings are the more natural, the distribution of the plants have been taken into account. To this end the diagrams, Fig. 1 & 2, have been prepared. It must be mentioned that other characters which might be thought helpful have been investigated and prove not to be so. Superficially the plants present an appearance of variation in calyx shape which might be thought significant but this is due to stages in maturity ; *Honey* 716 and *F. White* 3241 show this since they

*Taxon 4 : 73 (1955).

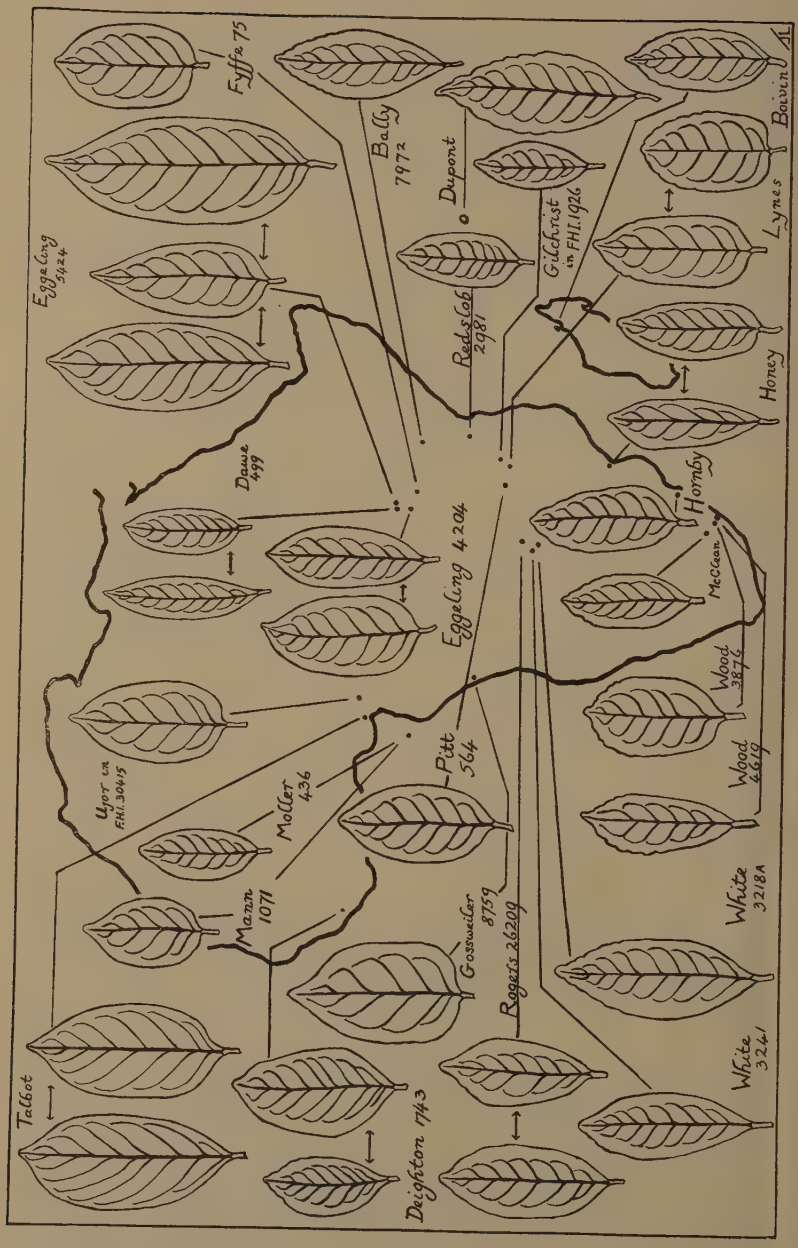


FIG. 2. Diagram showing the variation in leaf shape within the group being considered ; all leaves are drawn to the same scale, × 2/9. The specimens are the same ones which have been analysed in Fig. 1.

possess both squat cup-shaped calyces containing fruits as well as narrow cylindrical flowering ones. The number of locules in the ovary is usually two, only two cases are known of three, one in a flower from the type of *C. nodosa*, the other (*fide* Alston) in *C. redslobii*. The nature of the fruits may provide useful characters but so few gatherings include mature fruits that correlation concerning their characters cannot be assessed : they vary in shape from ellipsoid to subspherical or obovoid. The vegetative parts of the plants of this group are almost wholly glabrous when mature ; the bark scarcely varies throughout.

The variation of ovary indumentum is not continuous. The hairs present in some examples of *C. ugandensis* are very sparse, more or less upright, occurring apically and in the sutures above. In the "*verticillata*" group and *C. gummiflua* the indumentum is regular and usually more or less completely clothes the upper half of the ovary (but is almost obsolete in *Pitt* 564, for example); the fruits are much more sparsely and shortly pubescent above ; the fruits of *Ujor in FHI.* 30415 are somewhat sparsely puberulous in the upper quarter. This latter plant causes great difficulty ; it is undoubtedly allied to the "*verticillata*" group and yet is geographically isolated therefrom.

The variation of the leaves, shown in Fig. 2, gives no absolute distinctness to any of the groups or "species" ; there is a tendency for the plants closely grouped round the Congo basin to have relatively broader leaves, rounded below with entire margins and for those further away to have relatively narrower ones, cuneate below with the margin shallowly sinuate or bluntly and shallowly serrate above.

The solution that might be accepted of redefining the groups and "species" as species, has little appeal since they would still only be distinguished absolutely from one another by little else than their geographical distribution. The "*verticillata*" group differs from the "*mannii*" group only in the presence of the ovary indumentum, which is variable in the "*ugandensis*" group ; *C. gummiflua* differs from the "*verticillata*" group only in the pedicel length and from *C. rogersii* only in the lack of ovary indumentum and so on as can be seen from the diagrams. It is found impossible to treat these plants as anything other than the members of a widespread variable species, the earliest name for which is *C. gummiflua* Tul.

As botanists, especially those on the African mainland, may look askance at this great reduction to synonymy[4] under the Madagascan name, an effort has been made to define nameable infraspecific entities. On the basis of the characters discussed above it is possible, if one or other of them is left out of account, to define a number of geographically distinct subspecies in several different ways. The greatest difficulty is that the character usually considered in this genus as the most useful, the ovary indumentum, is the most haphazardly distributed ; it cannot be used alone and yet should not be neglected[5]. The only coherent way to

[4] A similar reduction on similar evidence may be compared, that of *Diplorrhynchus* 'species' by Duvigneaud, Martier and Dewit in Bull. Soc. Roy. Bot. Belge 84 : 243 (1952).

[5] It may be noticed that a botanist who, by chance, studied a selection from this material would be able to produce an elegant infraspecific scheme of natural appearance ; omitting *C. gummiflua* and *Ujor in FHI* 30415 the plants would fall into two subspecies based on pedicel-length or ovary indumentum.

define entities within this species is to reduce the groups and " species " to the status of varieties as follows :—

Pedicels up to 4 mm. long ; calyx lobes and petals 5–6 or more rarely 7 (–8) :

Ovary regularly pubescent in ± the upper half ; fruit puberulous in upper quarter . . . . . var. **verticillata**

Ovary glabrous . . . . . var. **mannii**

Pedicels up to 2 mm. long ; calyx lobes and petals 4–5 :

Ovary regularly pubescent in ± the upper half ; calyx lobes and petals 5 . . . . . var. **gummiflua**

Ovary glabrous or very sparsely and irregularly hirsute above ; calyx lobes and petals 4–5 . . . . . var. **ugandensis**

var. **gummiflua**

Characters as in the key and leaves ± narrowly elliptic, ± cuneate below, margin entire or shallowly sinuate above.

Distribution : Madagascar : *Boivin* (P, holo. ! ; K, ? iso. !).

Syn. : 1 & 2[6].

A tree from a tropical island near the sea.

var. **mannii** (*Hook. f. ex Oliv.*) *J. Lewis*, stat. nov.

Characters as in the key and leaves broadly elliptic, ± rounded below, margin entire.

Distribution : St. Thomas island : *Mann* 1071 (K, holo. !) and Bom Successo, *Moller* 436 (COI, !) ; S. Nigeria and Angola.

Syn. : 3, 4, 13 & 14[6].

A tree of island rain forest and on mainland rivers near the sea.

The Angola plant may be considered as a form with 7 (–8) calyx-lobes and (13–) 14 (or 16) stamens.

var. **verticillata** (*N. E. Brown*) *J. Lewis*, stat. nov.

Characters as in the key and leaves narrowly elliptic, elliptic or rarely broadly elliptic, cuneate or rarely rounded below usually shallowly sinuate or bluntly and shallowly serrate above, rarely entire.

Distribution : S. Africa : *Wood* 3876 & 4619 (K, syn. !) and *McClean* 468 (K !) ; Portuguese East Africa, *Honey* 716 (K !) & Mapato District, *Hornby* 2524 ; Tanganyika, *Pitt* [*-Schenkel*] 553 & 564, *Gilchrist in FHI* 1926, *Lynes* 25 and *Eggeling* 6535 ; Cameroons, Bamenda district, Bali-Ngemba forest reserve, *Ujor in FHI* 30415 and Seychelles (probably introduced).

[6] These numbers denote the inclusion in synonymy of the corresponding names in the list on page 147.

Syn. : 5, 6, 7, 10 & 15.[6]

A forest tree, and by rivers nearer the sea ; 300–2100 m.

The Cameroons specimen may be considered as a form with elliptic to broadly elliptic leaves, ± rounded below and with the margin entire ; these characters are not found constantly associated in the remaining material. It comes from a higher and more nearly equatorial habitat than the rest of the material.

var. **ugandensis** (*Stapf*) *J. Lewis*, stat. nov.

Characters as in the key and leaves narrowly to broadly elliptic, rounded to cuneate below, entire to shallowly sinuate or bluntly and shallowly serrate above.

Distribution : Belgian Congo ; Uganda : *Dawe* 499 (K, holo. !), *Eggeling* 4204 & 5424 and *Fyffe* 29 & 75 ; Kenya : *Logie in Bally* 7972 ; and N. Rhodesia, *F. White* 3218A & 3241.

Syn. : 8, 9, 11 & 12[6].

A tree of swamp forest at 1500–1800 m. and in riverside gallery forest at lower altitudes in higher latitudes.

The Uganda and Tanganyika material has leaves more commonly rounded below and usually relatively broader than those of N. Rhodesia and Kenya in which cuneate bases are the rule. The tendency of the leaves to have the margin shallowly sinuate or bluntly and shallowly serrate is absent in Uganda, distinct in N. Rhodesia and partial in Kenya. The Uganda plants are at a higher altitude than the remainder.

Note. The above treatment of *C. gummiflua* does not deal with the whole of a taxonomic group. This results from the necessity of compromise for the Flora of Tropical East Africa between a full new treatment of the genus and the uncritical acceptance of past treatment. To this end sufficiently widely distributed material has been studied to enable a decision to be reached as to the affinities, and hence the names, of the East African entities. *C. gummiflua* is the earliest specific epithet found within the group studied and (as it is the type species of the subgenus) will ever fall. It is the author's unconfirmed belief that other "species" will be found to be includable in this species. This is especially true of *C. paludosa* Hutch. & Dalz. ex Jac.-Fél. in Rev. Bot. Appliq. 32 : 268 (1952) which is distinguishable from *C. rogersii* only in its greater range of pedicel length and from the "*verticillata*" group only on account of its glabrous ovary. The most interesting point about *C. paludosa* is that its leaves are so very like those of *C. rogersii*, even in their texture ; there is the same tendency here relative to the "*mannii*" group as that which *C. rogersii* shows within the "*ugandensis*" group, and this relationship is similarly directed geographically, i.e., away from the Congo basin.

Of species which were included in the subgenus *Dactylopetalum* in 1925 and not dealt with here, *C. annobonensis* will probably prove to be synonymous with the *C. gummiflua* complex while *C. myriocarpa* may not, *C. zenkeri* and *C. dinklagii* appear synonymous with one another but are wrongly placed in this subgenus and *C. barteri* although distinguished from *C. gummiflua* Tul. by its heavily, wholly and permanently pubescent ovary might well be considered as a subspecies of this latter. None of these considerations will affect the taxa or their names in East Africa so further consideration of them is deferred. The same is true for species described since 1925 and not included in the taxonomic treatment but of these *C. paludosa* has been included in the diagrams because of the intrinsic interest of its characters geographically. Final revision of the subgenus will undoubtedly alter the above scheme to some extent ; the inclusion of *C. paludosa* in var. *mannii* would increase the variation of that variety considerably, for example.

There is a great need for collections of species of *Cassipourea* with mature fruits ; from the few gatherings seen of these organs it is anticipated that their detailed shape will provide diagnostic criteria.

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[6] As opposite.

Miniature Daffodils.*—This book is the result of over thirty years' experience in growing and breeding miniature daffodils. The author, who has probably the largest collection in the world on his daffodil farm near Camborne in Cornwall, is an acknowledged expert on the cultivation of these fascinating little flowers and gives cultural details for growing them both in and out of doors. The book contains useful information on raising these miniatures from seed, hybridizing, and descriptions of many species and varieties followed by lists of dwarf forms suitable for various purposes. It is illustrated by black and white photographs of typical varieties and is provided with an index. Out of the fulness of his knowledge of these little plants Mr. Gray has written a sound practical book which will be welcomed by those who wish to grow and learn more about them.

H. S. MARSHALL.

* Miniature Daffodils. By Alec Gray : London : W. H. & L. Collingridge Ltd. New York : Transatlantic Arts Inc. 1955. Pp. 57. Price 15/-.

Micro-elements in crop nutrition.*—It is no mean task to present a summary of over 1,000 original papers concerning a rapidly advancing subject within the compass of a book of less than 250 pages. Nevertheless this is what Doctors K. N. Lal and M. S. Sabba Rao have done in a small volume dealing with the part played by micro-elements in the nutrition of plants, and especially of crop plants. The book is divided into 9 chapters which respectively deal with such topics as deficiency symptoms, toxic symptoms, the interaction of micro-nutrients on one another, the influence of the environment on the uptake of these substances, and so forth. At the end of each chapter there is a bibliography, and the book ends with separate indexes to authors and subjects. The text consists essentially of a précis of the literature, without much critical comment. There are some graphs illustrating previously unpublished data obtained by the authors concerning such topics as the relationship of dry weight and of net assimilation rate to the concentration of micro-nutrients. The book will no doubt be useful to all who specialize in the mineral nutrition of plants.

C. R. METCALFE.

* Micro-element Nutrition of Plants by K. N. Lal, M.Sc., D.Sc., FBS and M.S. Subba Rao, M.Sc. (Ag.), Ph.D. Pp. viii + 246 ; Benares Hindu University Press, 1954. Price 20/- net.